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JAYPEE BROTHERS MEDICAL PUBLISHERS
The Health Sciences Publisher
New Delhi | London

Jaypee Brothers Medical Publishers (P) Ltd

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Jaypee Brothers Medical Publishers (P) Ltd
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Ansari Road, Daryaganj
New Delhi 110 002, India
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Fax: +44 (0)20 3008 6180
Email: info@jpmedpub.com

Website: www.jaypeebrothers.com
Website: www.jaypeedigital.com

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Community Medicine Buster

First Edition: 2017
Second Edition: 2020
Third Edition: 2022
Fourth Edition: 2023
Fifth Edition: **2025**
ISBN: 978-93-5696-994-0
Printed at: Samrat Offset Pvt. Ltd.

Foreword

It is indeed a great pleasure and honor for me to write a few words for the book titled *Community Medicine Buster*, 5th edition by Dr Gautam Sarker and Dr Palash Das. It is a 10-year solved Question–Answer book of 30 universities of India for the undergraduate and postgraduate students and includes fully Competency-Based Medical Education (CBME) as per the new curriculum. In this book, chapters are arranged chronologically, and questions and answers are sequentially written in the context of different university questions which will enable the readers to prepare for written examination as well as viva. Moreover, this type of book is a first of its kind in India.

Every attempt has been made to provide authentic and latest information in the book. It is hoped that this book will be useful for the undergraduate and postgraduate medical students, doctors, researchers, trainers of medical and paramedical personnel, and those concerned with the delivery of community health services.

In this context, the endeavor of the authors is to present this book as a "Ready Reckoner".

I congratulate both the authors for their hard work in bringing out this useful publication and wish many more of such successful efforts in future.

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Competency Table

No.	Competency: The student should be able to	Core (Y/N)	Suggested teaching learning method	Suggested assessment method	Chapter number	Page number
Topic 1: Concept of Health and Disease, Ethics in Medicine and Doctor-patient Relationship		**Number of competencies: (10)**		**Number of procedures that require certification: (NIL)**		
CM 1.2	Define health and describe the concept of holistic health	Y	Lecture, Small group discussion	Written/Viva voce	01	1
CM 1.2	Describe the concept of spiritual health	Y	Lecture, Small group discussion	Written/Viva voce	01	1
CM1.2	Define and describe the relativeness of health	Y	Lecture, Small group discussion	Written/Viva voce	01	2
CM1.1	Define and describe the concept of public health	Y	Lecture, Small group discussion	Written/Viva voce	01	3
CM1.2	Define health and describe the determinants of health	Y	Lecture, Small group discussion	Written/Viva voce	01	4
CM1.3	Describe the characteristics of agent, host and environmental factors in health and disease and the multi factorial etiology of disease	Y	Lecture, Small group discussion	Written/Viva voce	01	5–6
CM1.4	Describe and discuss the natural history of disease	Y	Lecture, Small group discussion	Written/Viva voce	01	7
CM1.5	Describe the application of interventions at various levels of prevention	Y	Lecture, Small group discussion	Written/Viva voce	01	9
CM1.6	Describe and discuss the concepts, the principles of health promotion and education, IEC and behavioral change communication (BCC)	Y	Lecture, Small group discussion	Written/Viva voce	01	10
CM1.7	Enumerate and describe health indicators	Y	Lecture, Small group discussion	Written/Viva voce	01	12–13
CM1.8	Describe the demographic profile of India and discuss its impact on health	Y	Lecture, Small group discussion	Written/Viva voce	01	14
CM 1.9	Demonstrate the role of effective communication skills in health in a simulated environment	Y	DOAP sessions	Skill assessment	01	14
CM1.10	Describe the important aspect of the doctor-patient relationship in a simulated environment	Y	DOAP sessions	Skill assessment	01	15
Topic 2: Relationship of Social and Behavioural Sciences to Health and Disease		**Number of competencies: (05)**		**Number of procedures that require certification: (NIL)**		
CM2.2	Describe the family types, its role in health and disease	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce/ Skill assessment	02	31

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM2.1	Describe the steps and perform clinico-socio-cultural and demographic assessment of the individual, family and community	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce/ Skill assessment	02	33
CM2.2	Demonstrate in a simulated environment the correct assessment of socioeconomic status	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce/ Skill assessment	02	33
CM2.2	Describe the sociocultural factors in health and disease	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce/ Skill assessment	02	35–37
CM2.4	Describe social psychology, community behaviour and community relationship and their impact on health and disease	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	02	37–38
CM2.3	Describe and demonstrate in a simulated environment, the assessment of barriers to good health and health seeking behavior	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce/ Skill assessment	02	38
CM2.5	Describe poverty and social security measures and its relationship to health and disease	Y	Lecture, Small group discussion	Written/Viva voce	02	39
Topic 3: Environmental Health Problems		***Number of competencies: (06)***		***Number of procedures that require certification: (NIL)***		
CM3.2	Describe concepts of safe and wholesome water, sanitary sources of water	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	49
CM3.1	Describe the health hazards of water pollution	Y	Lecture, Small group discussion	Written/Viva voce	03	51
CM3.3	Describe the etiology and basis of water borne diseases (jaundice/ hepatitis/diarrheal diseases)	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	51
CM3.2	Describe water purification processes	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	64
CM3.2	Describe water quality standards	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	67
CM3.2	Describe concepts of water conservation and rainwater harvesting	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	73
CM3.5	Describe the standards of housing and the effect of housing on health	Y	Lecture, Small group discussion	Written/Viva voce	03	75
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CM3.1	Describe the health hazards of air pollution	Y	Lecture, Small group discussion	Written/Viva voce	03	80
CM3.1	Describe the health hazards of noise pollution	Y	Lecture, Small group discussion	Written/Viva voce	03	82

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM3.1	Describe the health hazards of radiation pollution	Y	Lecture, Small group discussion	Written/Viva voce	03	83
CM3.6	Describe the role of vectors in transmission/causation of diseases	Y	Lecture, Small group discussion	Written/Viva voce	03	84
CM3.6	Discuss national vector-borne disease control program	Y	Lecture, Small group discussion	Written/Viva voce	03	85
CM3.7	Dentify and describe the identifying features and life cycle of vectors of public health importance and their control measures	Y	Lecture, Small group discussion, DOAP session	Written/Viva voce	03	110
CM3.8	Describe the mode of action, application cycle of commonly used insecticides and rodenticides	Y	Lecture, Small group discussion	Written/Viva voce	03	113
Topic 4: Principles of Health Promotion and Education		***Number of competencies: (03)***		***Number of procedures that require certification: (NIL)***		
CM4.2	Describe the methods of organizing health promotion and education activities at individual family and community settings	Y	Lecture, Small group discussion	Written/Viva voce	04	132
CM4.1	Describe various methods of health education with their advantages and limitations	Y	Lecture, Small group discussion	Written/Viva voce	04	132
CM4.1	Social marketing program; A method of health education	Y	Lecture, Small group discussion	Written/Viva voce	04	138
CM4.3	Demonstrate and describe the steps in planning, organizing, implementation and evaluation of health promotion and education program	Y	Small group session, DOAP session	Written/Viva voce/ Skill assessment	04	139
CM4.2	Describe the concept and method of health counseling	Y	Lecture, Small group discussion	Written/Viva voce	04	140
Topic 5: Nutrition		***Number of competencies: (08)***		***Number of procedures that require certification: (NIL)***		
CM5.1	Describe the common sources of various nutrients and special nutritional requirements according to age, sex, activity, physiological conditions	Y	Lecture, Small group discussion	Written/Viva voce	05	148
CM5.4	Plan and recommend a suitable diet for the individuals and families based on local availability of foods and economic status, etc in a simulated environment	Y	DOAP sessions	Skill Assessment	05	149
CM5.2	Describe and demonstrate the correct method of performing a nutritional assessment of individuals, families and the community by using the appropriate method	Y	DOAP sessions	Skill Assessment	05	150
CM5.3	Define and describe common nutrition related health disorders (including macro-PEM, Micro-iron, Zn, iodine, Vitamin A), their control and management	Y	Lecture, Small group discussion	Written/Viva voce	05	154

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM5.5	Describe the principles of nutritional rehabilitation in the context of socio-cultural factors	Y	Lecture, Small group discussion	Written/Viva voce	05	164
CM5.5	Describe the principles of nutritional education		Lecture, Small group discussion	Written/Viva voce	05	170
CM5.5	Describe the methods of nutritional surveillance		Lecture, Small group discussion	Written/Viva voce	05	170
CM5.6	Enumerate and discuss important national nutritional Programs including ICDS, etc.	Y	Lecture, Small group discussion	Written/Viva voce	05	171
CM5.6	Describe school health program	Y	Lecture, Small group discussion	Written/Viva voce	05	173
CM5.6	Enumerate and discuss the national nutrition policy	Y	Lecture, Small group discussion	Written/Viva voce	05	175
CM5.7	Describe food hygiene including food and milk borne diseases	Y	Lecture, Small group discussion	Written/Viva voce	05	176
CM5.8	Describe and discuss the effects of additives and adulteration	Y	Lecture, Small group discussion	Written/Viva voce	05	180
CM5.8	Describe and discuss the importance and methods of food fortification	Y	Lecture, Small group discussion	Written/Viva voce	05	181
Topic 6: Basic Statistics and its Applications and Research Methodology		**Number of competencies: (04)**		**Number of procedures that require certification: (NIL)**		
CM6.2	Describe and discuss the classification of statistical data	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	204
CM6.2	Describe and discuss the principles and demonstrate the methods of collection of data	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	205
CM6.2	Describe and discuss the analysis, interpretation and presentation of statistical data	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	208
CM6.3	Describe, discuss and demonstrate the application of elementary statistical methods	Y	Small group, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	212
CM6.4	Describe the measures of central tendency	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	212
CM6.4	Describe and discuss measures of dispersion	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	214
CM6.4	Describe and discuss frequency distributions	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	216
CM6.4	Enumerate, discuss and demonstrate common sampling techniques	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	220
CM6.3	Describe, discuss and demonstrate test of significance in various study designs	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/ Skill assessment	06	226

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM6.1	Formulate a research question for a study	Y	Small group discussion, Lecture, DOAP sessions	Written/Viva voce/Skill assessment	06	231
Topic 7: Epidemiology		**Number of competencies: (09)**		**Number of procedures that require certification: (NIL)**		
CM7.1	Define epidemiology and describe and enumerate the principles, concepts and uses of epidemiology	Y	Small group discussion, Lecture	Written/Viva voce	07	246
CM7.3	Enumerate, describe and discuss the sources of epidemiological data		Small group discussion, Lecture	Written/Viva voce	07	247
CM7.5	Enumerate, define, describe and discuss epidemiological study designs	Y	Small group discussion, Lecture	Written/Viva voce	07	249
CM7.8	Describe the principles of association, causation in epidemiological studies	Y	Small group discussion, Lecture	Written/Viva voce	07	260
CM7.8	Describe the biases in epidemiological studies	Y	Small group discussion, Lecture	Written/Viva voce	07	263
CM7.2	Enumerate, describe and discuss the modes of transmission communicable diseases	Y	Small group discussion, Lecture	Written/Viva voce	07	264
CM7.2	Enumerate, describe and discuss measures for prevention and control of communicable diseases	Y	Small group discussion, Lecture	Written/Viva voce	07	267
CM7.2	Describe and discuss measures for prevention and control of non-communicable diseases	Y	Small group discussion, Lecture	Written/Viva voce	07	268
CM7.4	Define, calculate and interpret morbidity indicators based on given set of data	Y	Small group, DOAP sessions	Written/Skill assessment	07	269
CM7.4	Define, calculate and interpret mortality indicators based on given set of data	Y	Small group, DOAP sessions	Written/Skill assessment	07	272
CM7.7	Describe and demonstrate the steps in the investigation of an epidemic of communicable disease and describe the principles of control measures	Y	Small group discussion, DOAP sessions	Written/Skill assessment	07	275
CM7.9	Describe and demonstrate the application of computers in epidemiology	Y	Small group discussion, DOAP sessions	Written	07	279
CM7.6	Enumerate and evaluate the need of screening tests	Y	Small group discussion, DOAP sessions	Written/Skill assessment	07	292
Topic 8: Epidemiology of Communicable and Nnoncommunicable Diseases and Related Disease Specific National Health Programs		**Number of competencies: (07)**		**Number of procedures that require certification: (NIL)**		
CM8.5	Describe and discuss the principles of planning, implementing and evaluating control measures for disease at community level bearing in mind the public health importance of the disease	Y	Small group discussion, Lecture	Written/Viva voce	08	319

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page numb...
CM8.1	Describe and discuss the epidemiological and control measures including the use of essential laboratory tests at the primary care level for communicable diseases	Y	Small group discussion, Lecture	Written/Viva voce	08	321
CM8.3	Enumerate and describe disease specific national health programs including their prevention and treatment of a case	Y	Small group discussion, Lecture	Written/Viva voce	08	321
CM8.4	Describe the principles and enumerate the measures to control a disease epidemic	Y	Small group discussion, Lecture	Written/Viva voce	08	369
CM8.2	Describe and discuss the epidemiological and control measures including the use of essential laboratory tests at the primary care level for noncommunicable diseases (Diabetes, Hypertension, Stroke, CHD, Obesity, Cancer, Blindness, Accidents and Injuries and Rheumatic heart disease etc.) and their national health programs	Y	Small group discussion, Lecture	Written/Viva voce	08	369
CM8.6	Integrated disease surveillance Program (IDSP)	Y	DOAP sessions	Skill assessment	08	411
CM8.6	Educate and train health workers in disease surveillance, control and treatment and health education	Y	DOAP sessions	Skill assessment	08	412
CM8.7	Describe the principles of management of information systems	Y	Small group discussion, Lecture	Written/Viva voce	08	413
Topic 9: Demography and Vital Statistics, Population Stabilization and Medical Genetics		***Number of competencies: (07)***		***Number of procedures that require certification: (NIL)***		
CM9.1	Define and describe demographic cycle, the principles of demography and vital statistics	Y	Small group discussion, Lecture	Written/Viva voce	09	423
CM9.4	Enumerate and describe the causes and consequences of population explosion	Y	Small group discussion, Lecture	Written/Viva voce	09	424
CM9.4	Describe population dynamics of India	Y	Small group discussion, Lecture	Written/Viva voce	09	427
CM9.2	Define, calculate and interpret demographic indices including birth rate, death rate, fertility rates	Y	Lecture, Small group discussion, DOAP session	Skill assessment	09	427
CM9.3	Enumerate and describe the causes of declining sex ratio and its social and health implications	Y	Small group discussion, Lecture	Written/Viva voce	09	430
CM9.5	Describe the methods of population control	Y	Small group discussion, Lecture	Written/Viva voce	09	432
CM9.6	Describe the national population policy and health policy	Y	Small group discussion, Lecture	Written/Viva voce	09	432
CM9.7	Enumerate the sources of vital statistics including census, SRS, NFHS, NSSO, civil registration system, etc.	Y	Small group discussion, Lecture	Written/Viva voce	09	434
Topic10: Reproductive, Maternal, Newborn, Child, Adolescent Health and Nutrition (RMNCH +N)		***Number of competencies: (09)***		***Number of procedures that require certification: (NIL)***		
CM10.1	Describe the current status of reproductive, maternal, newborn and child health and common health problems	Y	Small group discussion, Lecture	Written/Viva voce	10	447

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM10.3	Describe local customs and practices during pregnancy, childbirth, lactation and child feeding practices	Y	Small group discussion, Lecture	Written/Viva voce	10	447
CM10.4	Describe child survival and safe motherhood interventions (CSSM), RCH-I, CNA, RCH-II	Y	Small group discussion, Lecture	Written/Viva voce	10	449
CM10.4	Describe the reproductive, maternal, newborn, child, adolescent health and nutrition (RMNCAH+N)		Small group discussion, Lecture	Written/Viva voce	10	452
CM10.2	Enumerate and describe the methods of screening high risk groups (pregnant mother)	Y	Small group discussion, Lecture	Written/Viva voce	10	490
CM10.2	Describe Rashtriya Bal Swasthya Karyakaram and screening of high risk children (newborn and children of 0–18 years)	Y	Small group discussion, Lecture	Written/Viva voce	10	493
CM10.6	Enumerate and describe various family planning methods, their advantages and shortcomings	Y	Small group discussion, Lecture	Written/Viva voce	10	494
CM10.7	Enumerate and describe the basis and principles of the family welfare program including the organization, technical and operational aspects	Y	Small group discussion, Lecture	Written/Viva voce	10	557
CM10.5	Describe universal immunization program	Y	Small group discussion, Lecture	Written/Viva voce	10	515
CM10.5	Describe integrated management of neonatal and childhood illness (IMNCI) and other existing programs	Y	Small group discussion, Lecture	Written/Viva voce	10	551
CM10.8	Describe the physiology, problems, clinical management and principles of adolescent health	Y	Small group discussion, Lecture	Written/Viva voce	10	558
CM10.8	Describe rashtriya kishor swasthya karyakram including ARSH	Y	Small group discussion, Lecture	Written/Viva voce	10	561
CM10.9	Describe and discuss gender issues and women empowerment	Y	Small group discussion, Lecture	Written/Viva voce	10	562
Topic 11: Occupational Health		***Number of competencies: (05)***		***Number of procedures that require certification: (NIL)***		
CM11.3	Enumerate and describe specific occupational health hazards, their risk factors and preventive measures	Y	Small group discussion, Lecture	Written/Viva voce	11	575
CM11.1	Enumerate and describe the presenting features of patients with occupational illness including agriculture	Y	Small group discussion, Lecture	Written/Viva voce	11	579
CM11.4	Describe the principles of ergonomics in health preservation	Y	Small group discussion, Lecture	Written/Viva voce	11	581
CM11.2	Describe the role, benefits and functioning of the employees state insurance scheme	Y	Small group discussion, Lecture	Written/Viva voce	11	582
CM11.5	Describe occupational disorders of health professionals and their prevention and management	Y	Small group discussion, Lecture	Written/Viva voce	11	584

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
Topic 12: Geriatric Health		**Number of competencies: (04)**		**Number of procedures that require certification: (NIL)**		
CM12.1	Define and describe the concept of geriatric services	Y	Small group discussion, Lecture	Written/Viva voce	12	593
CM12.2	Describe health problems of aged population	Y	Small group discussion, Lecture	Written/Viva voce	12	593
CM12.3	Describe the prevention of health problems of aged population	Y	Small group discussion, Lecture	Written/Viva voce	12	594
CM12.4	Describe national program for elderly	Y	Small group discussion, Lecture	Written/Viva voce	12	595
Topic 13: Disaster Preparedness and Management		**Number of competencies: (04)**		**Number of procedures that require certification: (NIL)**		
CM13.1	Define and describe the concept of disaster management	Y	Lecture, Small group discussion	Written/Viva voce	13	598
CM13.2	Describe disaster management cycle	Y	Lecture, Small group discussion	Written/Viva voce	13	601
CM13.3	Describe man-made disasters in the world and in India	Y	Lecture, Small group discussion	Written/Viva voce	13	602
CM13.4	Describe the details of the national disaster management authority	Y	Lecture, Small group discussion	Written/Viva voce	13	603
Topic 14: Hospital Waste Management		**Number of competencies: (03)**		**Number of procedures that require certification: (NIL)**		
CM14.1	Define and classify hospital waste	Y	Lecture, Small group discussion, visit to hospital	Written/Viva voce	14	607
CM14.2	Describe various methods of treatment of hospital waste	Y	Lecture, Small group discussion, visit to hospital	Written/Viva voce	14	607
CM14.3	Describe laws related to hospital waste management	Y	Lecture, Small group discussion	Written/Viva voce	14	615
Topic 15: Mental Health		**Number of competencies: (03)**		**Number of procedures that require certification: (NIL)**		
CM15.1	Define and describe the concept of mental Health	Y	Lecture, Small group discussion	Written/Viva voce	15	621
CM15.2	Describe warning signals of mental disorder	Y	Lecture, Small group discussion	Written/Viva voce	15	621
CM15.3	Describe national mental health program	Y	Lecture, Small group discussion	Written/Viva voce	15	622
Topic 16: Health Planning and Management		**Number of competencies: (04)**		**Number of procedures that require certification: (NIL)**		
CM16.1	Define and describe the concept of health planning	Y	Small group discussion, Lecture	Written/Viva voce	16	627
CM16.2	Describe planning cycle	Y	Small group discussion, Lecture	Written/Viva voce	16	628
CM16.3	Describe health management techniques	Y	Small group discussion, Lecture	Written/Viva voce	16	629

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No.	Competency The student should be able to	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Chapter number	Page number
CM16.4	Describe health planning in India and National policies related to health and health planning	Y	Small group discussion, Lecture	Written/Viva voce	16	633
Topic 17: Health Care of the Community		**Number of competencies: (05)**		**Number of procedures that require certification: (NIL)**		
CM17.1	Define and describe the concept of health care to community	Y	Lecture, Small group discussion	Written/Viva voce	17	648
CM17.2	Describe community diagnosis	Y	Lecture, Small group discussion	Written/Viva voce	17	652
CM17.3	Describe primary health care, its components and principles	Y	Lecture, Small group discussion	Written/Viva voce	17	653
CM17.5	Describe health care delivery system in India	Y	Lecture, Small group discussion	Written/Viva voce	17	661
CM17.4	Describe national policies related to health and health planning and millennium development goals	Y	Lecture, Small group discussion	Written/Viva voce	17	655
CM17.4	Sustainable development goals	Y	Lecture, Small group discussion	Written/Viva voce	17	659
Topic 18: International Health and its Regulations		**Number of competencies: (02)**		**Number of procedures that require certification: (NIL)**		
CM 18.1	Define and describe the concept of International health and its regulations	Y	Lecture, Small group discussion	Written/Viva voce	18	684
CM 18.2	Describe roles of various international health agencies	Y	Lecture, Small group discussion	Written/Viva voce	18	686
Topic 19: Essentials Medicines and Rational Use of Drugs		**Number of competencies: (03)**		**Number of procedures that require certification: (NIL)**		
CM19.1	Define and describe the concept of essential medicine list (EML)	Y	Lecture, Small group discussion	Written/Viva voce	19	697
CM19.2	Describe roles of essential medicine in primary health care	Y	Lecture, Small group discussion	Written/Viva voce	19	698
CM19.3	Describe counterfeit medicine and its prevention	Y	Lecture, Small group discussion	Written/Viva voce	19	698
Topic 20: Recent Advances in Community Medicine		**Number of competencies: (04)**		**Number of procedures that require certification: (NIL)**		
CM20.1	List important public health events of last five years	Y	Lecture, Small group discussion	Written/Viva voce	20	700
CM20.2	Describe various issues during outbreaks and their prevention	Y	Lecture, Small group discussion	Written/Viva voce	20	705
CM20.3	Describe any event important to health of the community	Y	Lecture, Small group discussion	Written/Viva voce	20	706
CM20.4	Demonstrate awareness about laws pertaining to practice of medicine such as clinical establishment Act and human organ transplantation Act and its implications	Y	Lecture, Small group discussion	Written/Viva voce	20	709

DOAP session- Demonstrate, Observe, Assess, Perform

CHAPTER

1

Concept of Health and Disease

CM1.2: Define health and describe the concept of holistic health.

Q1. Define health. Describe limitation in WHO definition. Discuss with reasons one such definition of health, which you feel acceptable. *(WBUHS, 2012, 2023; TRIU, 2022; BNMUB, 2002; VKSUAB, 2018; PBDSUHSH, 2018; MU, 2022: VNSGUS, 2023)*

Ans: The widely accepted definition of health is given by the World Health Organization (1948) in the preamble to its constitution, which is as follows, **'Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'. This is desired to lead a socially and economically productive life.**

WHO definition of health has following limitations:

The WHO definition of health has been criticized as being too broad in sense:

- Health cannot be a state and also not static
- Some argue that health cannot be defined as a state at all, but must be seen as a continuous adjustment to the changing demands of living and of the changing meanings we give to life
- WHO definition of health is not an operational definition, because it does not lend itself to the direct measurement
- In a broad sense, 'health can be seen as a condition or quality of the human organism expressing the adequate functioning of the organism in given conditions, genetic or environmental'.

Concept of holistic health: Holistic concept of health is a synthesis of biomedical concept, ecological concept and psychosocial concept. It recognizes the strength of social, economic, political and environmental influences on health. It has been variously described as a unified or multidimensional process involving the well-being of the whole person in the context of environment. This view corresponds to the view held by the ancient's time that health implies a sound mind, in a sound body, in a sound family, in a sound environment. Thus, holistic approach indicates that all sectors of society have an effect on health, especially agriculture, animal husbandry, food, industry, education, housing, public works, communication and other sectors. The main focus is on promotion and protection of health.

CM1.2: Concept of spiritual health.

Q2. Spiritual dimension of health. *(ABKUB, 2018)*

Ans: Proponents of holistic health believe that the time has come to give serious consideration to the spiritual dimension and which plays a role in health and disease. So, spiritual health refers to that part of the individual which reaches out and strives for meaning and purpose in life. It is the intangible something that transcends physiology and psychology. As a relatively new concept, it seems to defy concrete definition. It includes integrity, principles and ethics, the purpose in life, commitment to some higher being and belief in concepts that are not subject to **"state of the art"** explanation.

CM1.2: Define and describe the relativeness of health and spectrum of health.

Q3. Explain briefly dimensions of health. *(RGUHS, 2012, 2014; TRIU, 2014, 2020, 2023; BNMUB, 20[illegible] VKSUAB, 2018; YSRUHSAP, 2013; RUJH, 2023; VBUJH, 202[illegible]*

Ans:

- **Physical:** Perfect functioning of body cells and organs
- **Social:** Interpersonal ties and involvement with community
- **Mental:** Balance between self and surrounding world
- **Emotional:** Feeling towards self and others
- **Spiritual:** Meaning and purpose in life
- **Socioeconomic:** Financial and societal placing
- **Environmental:** Harmony with physical, biological, chemical surroundings
- **Nutritional:** Nourishment status of body
- **Cultural:** Customs, beliefs and practice in family
- **Others:** Philosophical, vocational

Health is a relative phenomenon. It is a biological normal state based on statistical norms/standards. The use of reference values to diagnose or screen for disease implies that health is relative concept. Very often normal values differ between geographical areas, sexes, or age groups. For example, normal blood pressure differs between sexes and also varies with age and its pattern is not the same in all human populations. A statement of normal values must indicate the population referred to similarly, pulse rate, heart rate, height, weight, serum cholesterol and hemoglobin levels vary from person to person.

Variability is inherent in biomedical measurements upon which decision on individual patient care or community health programs are based. So, it is very important to establish standards on which decisions can be made. These standards are often referred to as normal values and are based on measurements made on a healthy population. It is important to draw a cutoff line between normal and abnormal.

Q4. Describe spectrum of disease.

(WBUHS, 2007; RGUHS, 2008; SAMU, 2011; BUMP, 2008; PBDSUHSH, 201[illegible]

Ans: Health and disease lie along a continuum and there is no single cut-off point. The lowest point on the health-disease spectrum is death and the highest point corresponds to the WHO definition of positive health. It is obvious thus health fluctuates within a range of optimum well-being to various levels of dysfunction including the state of total dysfunction, namely the death. The transition from optimum health to ill health is often gradual.

The spectral concept of health emphasizes that health of the individual is not static; it is a dynamic phenomenon and a process of continuous change, subject to frequent subtle variations. What is considered maximum health today may be minimum tomorrow. It implies that health is a state not to be attained once and for all but ever to be renewed. Spectrum of health can be described as follows:

Disease Spectrum:

Positive health
Better health
Freedom from sickness
Unrecognized sickness
Mild sickness
Severe sickness
Death

Q5a. Describe concept of positive health. *(AKUB, 2022; TDMGRMU, 2009; NU, 2013; RUJH, 2016)*

Ans: The concept of positive health is the perfect functioning of the body and mind in a person.

Components of positive health are given below:

- **Biological:** A state where every cell and organ is functioning at optimum capacity and in perfect harmony with the rest of the body.
- **Psychological:** A state where the individual feels a sense of perfect well-being and of mastery over his environment.
- **Social:** A state where the individual's capacities for participation in the social system are optimum.
- Finally, the concept of positive health will always remain a mirage because everything in our life is subject to change.

Concept of disease, illness and sickness:

- **Disease** is a physiological/psychological dysfunction
- **Illness** is a subjective state of the person who feels aware of not being well
- **Sickness** is a state of social dysfunction, i.e., a role that the individual assumes when ill

Q5b. Explain health and development are interrelated. *(TRIU, 2022)*

Ans: Health development is defined as **"the process of continuous progressive improvement of the health status of the population"**. Its product is rising level of human well-being, marked out by not only reduction in burden of disease but also by attainment of positive physical and mental health related to satisfactory economic functioning and social integration.

Health development contributes to and results from social and economic development. So, health development has been given increasing emphasis in the policies and programs of the United Nations system.

Examples: The World Bank is providing funds for the health component of economic development programs. United Nations Development Program (UNDP) has also shown interest in health development through the World Bank.

CM1.1: Define and describe the concept of public health.

Q6a. Explain briefly about public health. *(ABKUB, 2005, 2008)*

Ans: In 1920, Winslow defined public health as the science and art of preventing disease, prolonging life and promotion of health and efficiency through organized community effort. Presently public health is a combination of scientific discipline which includes epidemiology, biostatistics, laboratory medicine, social sciences and demography. It also includes epidemiological investigations, planning, management, interventions, surveillance and evaluation.

Q6b. Describe phases of public health. *(TDMGRMU, 2009, 2011)*

Ans: There are four phases of public health:

Phases	*Descriptions*
Disease control phase (1880–1920)	Public health during the 19th century was limited to sanitary legislation and sanitary reforms like water supply, sewage disposal, etc. These activities were not sufficient to control specific diseases. Technical knowledge was deficient in those days.
Health promotional phase (1920–1960)	At the beginning of 20th century, new concept in public health was health promotion. It was realized that state had a direct responsibility for the health of an individual. For the health promotion of the individuals, few services were came into action like child health services, school health services, industrial health services, mental health and rehabilitation services. In 1920, Winslow, great public health expert defined public health as "the science and art of preventing disease, prolonging life and promotion of health and efficiency through organized community effort". In 1946 in India, the Bhore Committee recommended the establishment of health centers for providing integrated curative and preventive services. The second great movement was community development program to promote village development through active participation of the whole community.

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Phases	Descriptions
Social engineering phase (1960–1980)	With the advancement of preventive medicine, some of the acute health problems were solved like diarrhea diseases. New health problems began to emerge like cancer, diabetes, cardiovascular diseases, alcoholism and drug addiction, etc. These diseases could not be explained on the basis of germ theory nor tracked by traditional approaches like isolation, immunization and disinfection. The concept of risk factors as determinants was highlighted. Reorientation of public health for control of chronic diseases on social perspectives was also described. In 1960, social engineering phase started on soc and behavioral aspect of diseases, then the term community health was introduced as a new concept.
"Health for all" phase (1981–2000 AD) (WBUHS, 2019)	Most people in developed countries and 20% population in developing countries are enjoying the determina of good health like adequate income, nutrition, education, sanitation, safe drinking water. Consequently, it was revealed that 80% world population have equal right to healthcare. Against the background in 1981, the members of WHO pledged themselves to an ambitious target of "health for all" by 2000 AD and attainment of a level of health that will permit all people "to lead a society and economically productive life".

CM1.2: Define and describe determinants of health.

Q7. Enumerate and discuss the different determinants of health.

(WBUHS, 2008, 2011, 2023; BNMUB, 2012, 2013; VKSUAB, 2018; YSRUHSAP, 201
RGUHS, 2014, 2024; SAMU, 2004; BUMP, 2008; SMU, 2010, 2011; KIMS, 2017; RUJH, 201
SSUHSA, 2011; TRIU, 2024; VNSGUS, 202

Ans: The different determinants of health are enumerated below:

Name of determinants	Discussion
Biological or heredity	The physical and mental traits of every human being are to determine by the nature of his genes at the moment of conception. Examples are chromosomal abnormalities, errors of metabolism and mental retardation.
Behavioral and sociocultural conditions	It is composed of cultural and behavioral patterns and lifelong personal habits, e.g., smoking, alcoholism. Many health problems in developed countries (e.g., coronary heart disease, obesity, lung cancer and drug addiction) are associated with lifestyle changes. In developing countries, traditional lifestyle still persists, lack of sanitation, poor nutrition, personal hygiene, etc.
Environment	It is classified as internal and external. Internal environment of man pertains to each and every component part, every tissue, organ and organ system and their harmonious functioning within the system. The external or macro environment consists of those things to which man is exposed after conception. It can be divided into physical, biological and psychosocial components, any or all of which can affect the health of man and his susceptibility to illness.
Socioeconomic condition	For majority of world's people, health status is determined primarily by their level of socioeconomic development, e.g., per-capita gross national product (GNP), education, nutrition, employment, housing political system of the country.
Economic status	GNP is the most accepted measure of economic performance. Economic progress is the major factors in reducing morbidity, increasing life expectancy and improving quality of life.
Education	A second major factor influencing health status is education especially female. The world map of illiteracy closely coincides with maps of poverty, malnutrition, high infant and child mortality. A major factors in lowest infant mortality in India is its high female literacy example in state of Kerala.
Nutrition	Nutrition is directly related to the health of a person. Poor nutrition means poor immunity; poor immunity means repeated infection and disease which is leading poor health.
Employment	Employment helps earn money by the individual or family. Employment provides confidence and honor to the person or family. Thus, purchasing capacity of the requirement including health will be guiding force to lead a good health of the individual and/or family.

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Name of determinants	Discussion
Housing	Housing provides care, safety, security of the family member(s). This protects family from rain, sun, cold and hot weather, robbery, provides comfort, cool and calm mind to work and many more things which indirectly provide health. So, housing plays its role in maintaining health in the society.
Occupation	Productive work promotes health vis-à-vis unemployment show higher incidence of ill-health and death.
Political system	Decisions concerning resource allocation, manpower policy, choice of technology depend upon political will. According to WHO, target of at least 5% expenditure of country's GNP on healthcare budget should be allocated. But India spent less in amount on the health budget.
Health services	The purpose of health services is to improve the health status of the population. Immunization of children protect from vaccine preventable diseases. Provision of safe water prevents mortality and morbidity from water borne diseases.
Aging of population	By the year 2020, the world will have more than one billion people aged 60 years and above and more than two-thirds of them living in developing countries.
Gender	In 1993, Global Commission on Women's Health was established. The commission drew up an agenda for action on nutrition, reproductive health, violence and aging.
Other factors	Coordination of outside formal health care systems such as food and agriculture, education, industry, social welfare, rural development is also important

Q8a. How do socioeconomic conditions act as one of the determinants of health?

(WBUHS, 2011, 2023; TRIU, 2023)

Ans: Influence of socioeconomic condition in health: In majority of world's people, health status is determined primarily by their level of socioeconomic development, e.g., economic status, education, nutrition, employment, housing, political system of the country.

Now we can conclude that socioeconomic condition acts as one of the determinants of health.

Q8b. Social determinants of health. *(WBUHS, 2021)*

Ans: Social determinants denotes health-behavior of persons. This includes cultural patterns, social values, habits (e.g., smoking, alcoholism, multiple sexual partners, etc). Many diseases having a strong association with certain lifestyles (e.g., AIDS, coronary heart disease, obesity, lung cancer). So, persons having these risk-factors/habits are considered as "at risk groups". These, lifestyle are developed through the process of socialization and social interaction with parents, friends, peer group.

However, not all lifestyle factors are harmful. There are many lifestyles that promote health.

Examples: Adequate nutrition, yoga exercises, meditation, etc.

CM1.3: Describe the characteristics of agent, host and environmental factors in health.

Q9. Describe in detail the agent, host and environmental factors.

(BNMUB, 2014, 2017; SMU, 2012, 2013, 2014; TDMGRMU, 2009; BUMP, 2016; SSUHSA, 2013; RUJH, 2011; TRIU, 2020)

Ans: Disease agents may be classified in the following groups:

Biological agents: Bacteria cause tuberculosis and tetanus. Virus causes poliomyelitis, hepatitis A. Protozoa cause hookworm, amoebic dysentery. Fungus causes ringworm. Rickettsiae cause endemic typhus, murine typhus.

Physical agents: Exposure to excessive heat, cold, humidity, pressure, radiation, electricity, sound, etc., may cause health and medical problems. Heat stroke and cramp, frostbite are examples of hazards caused by physical agents.

Chemical agents: Endogenous—urea, uric acid, bilirubin, calcium oxalate and ketones, insulin, etc., cause health problems. Exogenous—dust, gas, fumes, metals, allergens, etc., can cause multiple medical problem.

Mechanical agents: Friction, force, sprain, etc., can cause injury with a mechanical thrust.

Nutritional agents: Nutrients like carbohydrate, protein and fat, minerals and water—the excess and deficiency of which results in disease. Obesity, under-nutrition, anemia, xerophthalmia, etc., are few example.

Host: A host offers subsistence and lodging for a pathogen and may develop the disease. Some factors are important for development of disease. These factors are level of immunity, genetic make-up, level of exposure, state of health and overall fitness of host, etc., and these can determine the effect of a disease organism in the person concerned.

Other factors are very important for causation of disease. These are the genetic make-up of the host, ability of the pathogen to accept the new environment etc. These can also be determining factors for the development of disease. Some pathogens thrive only under limited ideal conditions.

Demographic characters, biological characters, social and economic characters, lifestyle factors are some other issues may provide information about insight of cause of disease.

Environment: The concept of environment is complex and all embracing. Biological factors can play an important role on environment. There are other factors as well like social, cultural and physical. Pathogen live in the surroundings of environment. Environment can be external to the human beings and it is called external or macro-environment. Environment can be within a host and it is called internal environment. Disease producing or preventing factors are prevalent in macro-environment. Susceptible population is affected and conscious people can utilize the factors in their favor. Physical and psychosocial factors can influence bodily disease and mental ill health.

Time is other factor which includes severity of illness in relation to how long a person is infected or until the condition causes death or passes the threshold of danger towards recovery.

Thus, disrupting the connection among agent, host and environment, the disease process and outbreak can be halted.

CM1.3: Describe the multifactorial etiology of disease.

Q10. What do you mean by "multifactorial causation" of disease? Describe with suitable examples.

(WBUHS, 2013, 2017; BNMUB, 2011; SAMU, 2015 YSRUHSAP, 2012; MUHS, 2019; AKUB, 2024; TRIU, 2023

Ans: It is an important concept in the causation of disease. Before this concept, various other types of concepts came to our minds and those are described in the following ways.

Germ theory of disease: This concept gained momentum during the 19th and early part of the 20th century. The concept of cause embodied in the germ theory of disease is generally referred to as a one-to-one relationship between the causal agent and the disease. As for example, we can cite the disease leprosy which is caused by *Mycobacterium leprae.*

Epidemiological triad: The germ theory has many limitations. For example, it is well known that everyone exposed to *M. tuberculosis* does not develop the disease tuberculosis. The same exposure, however, in an undernourished or otherwise susceptible patient may result in tuberculosis in a favorable environment. Beta-hemolytic streptococci also behave in similar way. So, some other factor plays its role in causation of disease in presence of agent and host. This may be simply taken as environment. The interplay of agent, host and environmental factors are responsible for causation of disease. This theory has been used for many years.

Multifactorial causation of disease is a revolutionary concept where Pettenkofer of Munich (1819–1901) was an early proponent of this concept. As a result of advances in public health, chemotherapy, vector control, antibiotics, communicable diseases began to decline and it was replaced by new types of diseases e.g., lung cancer, coronary heart disease, chronic bronchitis, mental illnesses, etc. These diseases could not be explained on the basis of germ theory of diseases and also, they could not be prevented by the traditional

methods. The realization began to dawn that the single cause idea was an oversimplification and there are other factors in the etiology of diseases. These are social, economic, cultural, genetic and psychological factors, etc. As already mentioned, tuberculosis is not merely due to tubercle bacilli, factors such as poverty, overcrowding, malnutrition also contribute to its occurrence.

Q11. What is web causation of disease?

(RGUHS, 2014; TRIU, 2014; SMU, 2013; DU, 2012; MGUB, 2023, 2024)

Ans: Web causation **(Fig. 1.1)** of disease was described by MacMahon and Pugh. According to them, disease occurs due to complex interaction of various predisposing factors. To control them sometimes removal of just one key link helps in control of disease. There is no need to control all factors associated in the disease causation. Individual factors do not carry much effect but one crucial factor may very important role in disease causation. Model is ideally suited for study of chronic disease.

BEINGS model of disease causation: These are different factors which interact in various directions with different strengths and ultimately lead to the development of a diseases.

- Behavioral and biological factors (virus, bacteria, fungi)
- Environmental factors (physical, biological)
- Immunological factors (immunity, vaccination, susceptibility)
- Nutritional factors (undernutrition, overnutrition)
- Genetic factors (familial disease)
- Social, services and spiritual factors (culture, customs, habits)

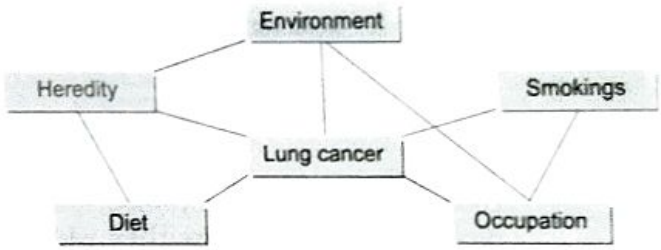

Fig. 1.1: Web causation.

CM1.4: Describe and discuss the natural history of disease.

Q12. Explain by diagram, natural history of disease, discuss how do you apply different modes of interventions in the natural history of disease?

(WBUHS, 2019, 2022; BNMUB, 2016, 2022; ABKUB, 2009, 2014; GITAMAP, 2023; YSRUHSAP, 2019; KIMS, 2022; SAMU, 2022; TRIU, 2021, 2023; RUJH, 2021; RGUHS, 2010; SMU, 2010; TDMGRMU, 2015; NU, 2015; SSUHSA, 2017; GOAU, 2021, 2023; AKUB, 2023; MGUB, 2024)

Ans: Meaning/concept of natural history of disease:

The natural history of disease **(Fig. 1.2)** is a key concept in epidemiology. It signifies the way in which a disease evolves over time from the earliest stage of its prepathogenesis phase to its termination as recovery, disability, death in the absence of treatment or prevention. Each disease has its own unique natural history, which is not necessarily the same for all individuals.

Modes of intervention:

- **Primary level at prepathogenesis state:**
  - **Health promotion:** This is an intervention in primary level of prevention. Examples, health education, lifestyle and behavioral change, environmental modification, nutritional interventions. In the presence of agent, host and environment health promotion is applied to prevent the development of disease process in prepathogenesis state.
  - **Specific protection:** Specific diseases are addressed here. Vaccinations against specific diseases like measles are examples of specific protection. This is primary level of prevention. Disease is not yet developed, and disease will not be seen after this intervention in this prepathogenesis state.
- **Secondary level at pathogenesis state (early pathogenesis phase):**
  - **Early diagnosis and treatment:** Detection of abnormality in bodies both physique and mind is the mainstay of disease control. Early detection of a case may reverse the health situation or medical

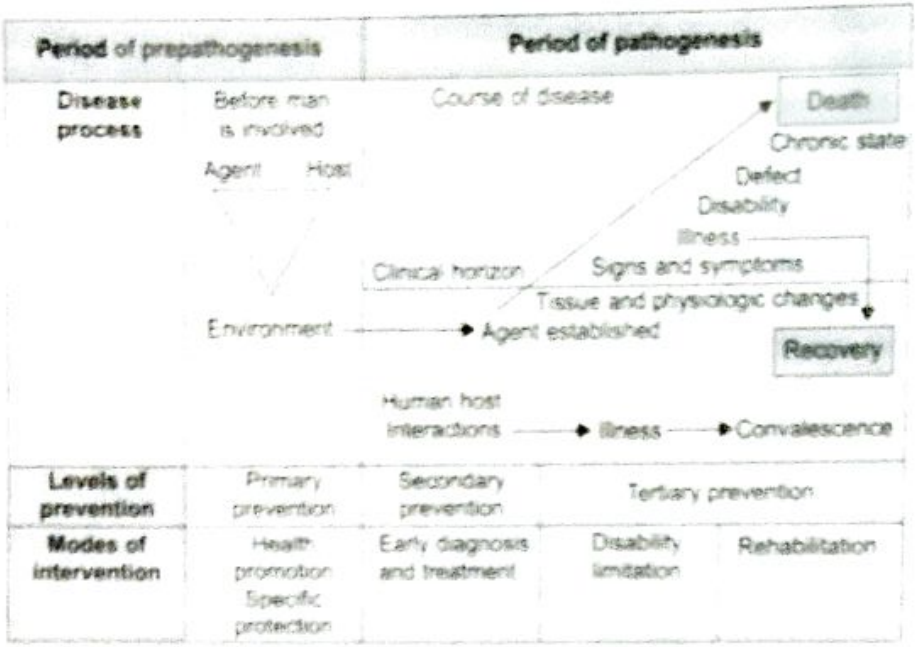

Fig. 1.2: Diagram of natural history of disease.

condition of the affected person(s) if he (they) gets the right treatment at earlier time. Pathogenic process has been completed here with discernible signs and symptoms of the disease. So, cases will given relief from the physical problem. General people will be protected from development of simi disease of infectious origin.

- **Tertiary level at pathogenesis state (late pathogenesis phase):**
  - **Disability limitation:** Sequence of events in disease may be recovery or death or recovery w complication(s), i.e., disability. If proper management is not done here in time, it may lead handicapped situation of the persons. So, disability will be prevented at this level of interventi Disease is advanced here with complication(s). Medical rehabilitation may be applied at this level
  - **Rehabilitation:** To get highest possible functional ability a disabled person is trained and retrained w combined and coordinated use of medical, social, educational and vocational measure. This is rea adopted to get patient's confidence and social honor at last stage of pathogenesis. The victims are ma confident to appear in the mainstream of community life. Thus, victims' life will be fruitful.

Q13. Discuss briefly how the knowledge of natural history of diseases helps us to prevent and control a disease in the community. *(ABKUB, 200*

Ans: Natural history of diseases (already discussed in previous question)

In the prepathogenesis phase of natural history of diseases, level of intervention is health promotion and specific protection.

The various measures of health promotion are health education, adequate nutrition, improvement o sanitation and housing, change of lifestyles, sex education, recreation facilities and yoga exercise.

In specific protection various measures are immunization, use of condom to prevent STI/RTI, vitamin A prophylaxis, use of helmet, lead apron against radiation hazards and pasteurization of milk.

In early pathogenesis phase, early diagnosis and treatment is the intervention:

Screening procedure for early diagnosis, investigation in pregnant mother, contact tracing and cluster testing for STIs, blood examination to detect diabetes. Periodic examination of industrial workers and Pap smear for carcinoma cervix.

Treatment modalities are chemotherapy, surgery, radiotherapy, psychotherapy.

In late pathogenesis phase, interventions are disability limitation and rehabilitation:

Disability limitation modalities are intensive or aggressive treatment of corneal xerosis to prevent blindness.

Types of rehabilitation are physical, vocational, social and psychological, examples are school for blinds, artificial limbs, crutches, wheel chair, hearing aids, intraocular lens implant, reconstruction surgery in leprosy, etc.

OM1.5: Describe the application of interventions at various levels of prevention.

Q14a. What is the concept of primordial prevention? Describe different levels of prevention and mode of interventions. *(ABKUB, 2005, 2022; BNMUB, 2014, 2019, 2020, 2021; GNSUB, 2022; AKUB, 2022, 2023; VKSUAB, 2021; GITAMAP, 2023; YSRUHSAP, 2021; SSUHSA, 2021, 2022, 2023; RGUHS, 2011, 2013; SAMU, 2009; TDMGRMU, 2010; TRIU, 2013, 2023; BUMP, 2013; KIMS, 2019, 2021, 2024; VNSGUS, 2023)*

Concept of primordial prevention is more appropriately used in case of noncommunicable diseases. *(AKUB, 2022)*

Ans: There are four levels of prevention of disease. Interventions are taken to prevent and control the disease, to treat the case, to limit disability and rehabilitate one such crippled case. The four levels are termed as: (1) Primordial prevention; (2) Primary prevention; (3) Secondary prevention and (4) Tertiary prevention.

Levels of prevention	Concepts	Mode of intervention	Examples
Primordial prevention	Prevention of population groups from risk factors which have not yet appeared	Individual and mass education	Obesity, hypertension in childhood, when lifestyles are formed (eating habit, smoking and physical exercise) can be prevented in the community. Discouraging children from adopting harmful habits/lifestyles
Primary prevention	Action taken prior to the onset of disease. It signifies intervention in pre-pathogenic phase of disease. Two approaches are population strategy and high-risk strategy	Promotion of health	Health education Environmental modifications Nutritional interventions Changes in lifestyle and behavior
		Specific protection	The following are some examples of specific protection immunization like vaccination against vaccine preventable diseases, use of specific nutrients, chemoprophylaxis, protection against accidents, protection from carcinogens, avoidance of allergens, etc.
Secondary prevention	Action which halts the process of disease at its incipient stage and prevent complications	Early diagnosis and treatment	Screening test and case finding program in case of hypertension and diabetes mellitus
Tertiary prevention	It signifies the measure undertaken in the late pathogenic phase of a disease to limit impairments and disabilities	Disability limitation	To prevent the transition of the disease process from impairment to handicap
		Rehabilitation	Reconstructive surgery in case of leprosy, correction of refractive error especially school going children, establishment of schools for blinds as well as deaf and dump

Q14b. Available modes of interventions in specific protection with examples: *(KIMS, 2024)*

Sl. No	Mode of intervention	Specification
1.	Immunization	Vaccination against vaccine preventable diseases
2.	Use of specific nutrients	Iron folic acid (IFA) tab iodized salt, vitamin A
3.	Chemoprophylaxis	Diphtheria, plague, conjunctivitis
4.	Protection against occupational hazards	Use of personal protective device
5.	Protection from carcinogens	Avoid smoked food which contain hydrocarbon
6.	Avoidance of allergens	Dust, pollen, fishes
7.	Protection from air pollution	Exhaust ventilation, dilution
8.	Protection from noise pollution	Control of vehicle, insulation
9.	Protection against accidents	Use of helmet and seat belt
10.	Use of safety consumer products like foods, cosmetics and drugs	Iodized salt, drugs with Indian Pharmacopoeia (IP)/British Pharmacopoeia (BP)

CM1.6: Describe and discuss the concepts, principles of health promotion and education, IEC and behavioral change communication (BCC).

Q15. What is health promotion? *(BNMUB, 2011; RGUHS, 2007; BUMP, 2010; DU, 2011; MU, 20*

Concepts and principles of health promotion.

Ans: Health promotion is **"process of enabling people to increase over, and to improve health."** It is n directed against any particular disease but intended to strengthen the host through a variety of approach **(interventions).**

The well-known interventions for health promotion are:

Health education: This is one of the most cost-effective interventions for health. In primary healthca approach, health education has been positioned at the beginning. There are many diseases (bo communicable and noncommunicable) which can be prevented by applying the knowledge in real fie Practice is followed by knowledge. If individuals possess knowledge, then they can apply it in real life situati with positive attitude. Health issues are selected first for a particular group of people depending upon th age, sex, occupation, education, society, etc. If practice is properly adopted by individuals, reduction disease incidence will be observed in the population.

Environmental modifications: Provision of potable water in its absence, installation of sanitary latrin improvement of houses are examples of intervention of environmental modification. This will reduce t incidence of common food and water borne diseases.

Nutritional intervention: Food distribution and nutrition improvement of vulnerable groups (child, mother nutrition education to mothers, food fortification, etc., are examples of nutrition intervention which w minimize nutrition disorders.

Lifestyle and behavioral changes: The lifestyle and behavioral pattern play their role in determinati of many health problems and keep health normal in favorable behavior. Tobacco use, alcohol use, lack exercise, overeating, etc., can cause medical problems providing health burden. On the contrary no tobacc no alcohol, regular exercise, optimum eating will help the individuals for maintenance of good health.

Q16. What is the concept of information, education and communication (IEC)? Describe in brief the various methods to deliver it. *(RGUHS, 2012; SAMU, 2009; SSUHSA, 2011, 2016; SMU, 2009; RUJH, 202*

Ans: Information, education and communication (IEC) are important approaches to bring about changes i knowledge, attitude and behavior of the people for betterment of their health and health of the family an community in which they live.

Information: It consists of providing scientific knowledge of people about the health problems and how t prevent them and promote and maintain good health. It brings about awareness in people.

Education: It consists of educating or motivating the people to change their lifestyle or behavior for betterme of their health. I may be either one-way or two-way process.

Communication: It is a complex process through various channels to reach the audience and in turn ge the feedback to know the effect of the process.

- It is a two-way process
- It is the main weapon to change the behavior of the people
- Its final goal is to change the people's knowledge, attitude, behavior and practices.

Components of IEC: A message is the information which communicator transmits to his audience to receiv understand, accept, act upon. It may be in the form of words, pictures, signs.

A good message must be:

- In line with the objectives
- Meaningful

- Based on felt needs
- Clear and understandable
- Specific and accurate
- Timely and adequate
- Fitting the audience
- Interesting
- Culturally and socially acceptable

Methods to delivered IEC are:

A. Individual and family health education:

- Personal contact
- Home visit
- Personal letters

B. Group health education:

- Lecture
- Demonstration
- Discussion methods: (i) Group discussion, (ii) Panel discussion, (iii) Symposium, (iv) Workshop, (v) Conference and seminar, (v) Role play

C. Health education for general public:

- Television
- Radio
- Newspaper
- Printed material
- Direct mailing
- Posters
- Folk methods
- Health museum and exhibitions, etc.

Q17. What is behavior change communication?

(TRIU, 2016, 2023; PBDSUHSH, 2013; ABKUB, 2011; KIMS, 2016; SSUHSA, 2011, 2015, 2016; SAMU, 2015; SMU, 2009; MGUB, 2024)

Ans: Behavior change communication (BCC) is an interactive process of any intervention with individuals, communities and/or societies to develop communication strategies to promote positive behaviors which are appropriate to their settings. This in turn provides a supportive environment which will enable people to initiate, sustain and maintain positive and desirable behavior outcomes.

BCC is the strategic use of communication to promote positive health outcomes, based on proven theories and models of behavior change. BCC employs a systematic process beginning with formative research and behavior analysis, followed by communication planning, implementation, and monitoring and evaluation. Audiences are carefully segmented, messages and materials are pretested, and mass media (radio, television, billboards, print material, and internet), interpersonal channels (client-provider interaction, group presentations) and community mobilization are used to achieve defined behavioral objectives.

BCC should not be confused with behavior modification, a term with specific meaning in a clinical psychiatry setting.

Steps:

BCC is the comprehensive process in which one passes through the stages:

Unaware → Aware → Concerned → Knowledgeable → Motivated to change → Practicing trial behavior change →Sustained behavior change

It involves the following steps:

1. State program goals
2. Involve stakeholders
3. Identify target populations
4. Conduct formative BCC assessments
5. Segment target populations
6. Define behavior change objectives
7. Define BCC strategy and monitoring and evaluation plan
8. Develop communication products
9. Pretest
10. Implement and monitor
11. Evaluate
12. Analyze feedback and revise

Implications: BCC is an effective tool for dealing with many community and group related problems. It has been adapted as an effective strategy for community mobilization, health and environment education various public outreach programs. Enhanced knowledge about the behavior change process has facilit the design of communications programs to reduce the risk of HIV transmission and AIDS. A wide var of health promotion strategies use communication as either an educational or norm-forming strateg addition, specific strategies must be designed for high-risk groups such as women, young people, injec drug abusers, homosexuals and HIV positive groups.

CM1.7: Enumerate and describe health indicators.

Q18a. What do you mean by the term "indicator of health"? *(WBUHS, 2023; MGUB, 2022; BNMUB, 20*

Ans: Meaning of the term "indicator of health":

Indicators are variables which help to measure changes. As the name suggest, **health indicators** are only indication of a given health situation or a reflection of that situation.

Q18b. Characteristics of an ideal indicator.

(WBUHS, 2018, 2023; TRIU, 2020, 2023; ABKUB, 2023; GNSUB, 20

- It should be valid, i.e., it should be actually measure what it supposed to measure.
- It should be reliable and objectives, i.e., the answer should be same if measured by different people similar circumstances.
- It should be sensitive, i.e., it should be sensitive to changes in the situation concerned.
- It should be specific, i.e., it should reflect changes only in the situation concerned.
- It should be feasible, i.e., they should have the ability to obtain data needed.
- It should be relevant, i.e., they should contribute to the understanding of the phenomenon of interest

Q19. List various indicators of health. *(WBUHS, 2015, 2018, 2019, 2023; TRIU, 2021, 2022; BNMUB, 20 VKSUAB, 2019; MU, 2022; YSRUHSAP, 2017, 2021; PBDSUHSH, 2018; BUMP, 20 SSUHSA, 2011; RUJH, 2010; SMU, 2012, 2013; DU, 2009; NU, 2011, 2017; MUHS, 20*

Health indicators of a community *(DBRAUA, 202*

Ans: List of various indicators of health:

Name of the indicators	Few important examples of indicators
Mortality indicators	• Infant mortality rate • Child death rate • Under 5 mortality rate • Maternal mortality ratio • Proportional mortality rate • Case fatality rate • Expectation of life

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Name of the indicators	Few important examples of indicators
Morbidity indicators	• Incidence rate • Prevalence rate • Hospital (OPD) attendance rate • Admission rate in hospital
Disability indicators	• Event type indicators • Number of days of restricted activities • Bed disability days • Work loss days • Limitation of morbidity • Limitation of activity
Nutritional status indicators	• Weight and height, mid-upper-arm circumference (MUAC) • Prevalence of low birth weight
Health care delivery indicator	• Doctor population ratio • Doctor-nurse ratio • Population-bed ratio
Utilization rates	• Vaccination coverage • Proportion of population using methods of family planning
Indicator of social and mental health	• Suicide • Homicide • Act of violence and crime • Drug abuse • Smoking • Alcohol consumption
Environmental indicators	• Solid waste • Liquid waste • Other biomedical waste
Socioeconomic indicators	• Overcrowding • Per capita GNP • Dependency ratio
Health policy indicators	• Proportion of GNP spent on health
Indicator of quality of life	• Physical quality of life index (PQLI) • Human development index (HDI)

Q20. List the various indicators of health which directly assess ill health in a community. *(BNMUB, 2018)*/ **Name the health indicator which is considered as the most important [sensitive] indicator of health of the community. Why is it so considered?** *(GNSUB, 2022; RGUHS, 2001; TRIU, 2014)*

Ans: Mortality indicators do not reveal the burden of ill health of the community. From these data, we can make plan and also take action to prevent any disease in future. Morbidity indicators are used to supplement mortality data to describe the health status of a population.

Direct indicators of health: Morbidity indicators are the direct indicators of health status of a community. The commonly used morbidity indicators are incidence and prevalence rate.

The incidence rate includes—numerator, denominator, time specification and multiplier is usually 1,000.

- Incidence rate is not influenced by the duration of disease.
- It is generally used for acute conditions. This is measured on incident cases for a time period usually a year.

Prevalence rate: This is measured on both new cases and old cases. It is usually expressed in percent. There are two types of prevalence namely point prevalence and period prevalence.

Q21. The other uses of "indicators of health" are: *(RGUHS, 2008)*

- To measure the health status of the community.
- To assess the healthcare needs and fixing of priorities.

- To compare health status in different states, districts and also other countries.
- To plan and implement health care services and distribution of resources accordingly.
- To measure healthcare services.
- To evaluate healthcare services.
- Lastly impact of above services delivered.

CM1.8: Describe the demographic profile of India and discuss its impact on health.

Demographic profile:

Size of the population: It refers to quantity of population. It can be enumerated by census. Large siz population over 1361 million in 2021 poses a challenge for universal coverage. To overcome this challe Sub-centers, PHCs, CHCs have to be established (setting up) as per Indian public health standards (IPH

Composition: It deals with age, gender, religion, literacy, occupation, income, marital status. It refer quality aspect of population.

Population growth: It refers to growth of population over a period of decades. It could be positive, z negative growth. The difference between birth rate and death rate is expressed as a number, which is call "demographic gap". It is mainly depending on fertility, mortality pattern, migration of the population.

Distribution: It is distribution of population as per geographic region in a given country.

Health impact: Demographic factors play an important role on health and disease etiology. It is essentia have knowledge about population with respect to its size, composition as well as growth.

- Age and sex mortality and geographical distribution with respect to different diseases are helpful planning and prevention and control measures for particular age-sex groups. Depending on the proble manpower, logistics and fund requirements are planned for addressing the above said problems.
- Declining female sex ratio: Population of 0–6 years girls is declining. At national level, this ratio is Low child sex ratio of 830, 846, 886 and 867 was observed in the State of Haryana, Punjab, Delhi a Chandigarh respectively. Sex selective abortion is may be the cause. This need to be corrected by st implementation of PNDT Act.
- Demographic data are useful for effective planning, designing evaluation and execution of health progra
- To know success or failure of health programs
- To identify important causes of mortality and morbidity.
- Due to demographic shift of ageing population, noncommunicable and degenerative diseases are on ri which require expensive lifelong treatment and care. Health and social problems of elderly populatio a challenging task in universal health coverage.

CM1.9: Demonstrate the role of effective communication skills in health in a simulated environment.

Role of effective communication skills in health and disease:

Communication skills of health workers like Doctors, ASHAs and Anganwadi workers are crucial and critic Good communication skills are essential to elicit correct history from the patients as well as counseling.

How to achieve this skill?

A. **Listening to community or client:** It is the most important skill in the communication process. It is th first step in community diagnosis and clinical diagnosis.

Medical students are allotted families during their field posting. They listen to family members in th community to find out their problems, felt needs after interacting with formal and informal leader and other organized groups like health and sanitation committee, AWWs, school teachers an NGOs.

Empathy: Through empathy we connect with others and sharing of experiences. Key components empathy is emotional connection with the client and community. It includes mirroring what a person feeling, to identify and understand another person's emotions (being happy, angry, sad).

B. **Speaking:** It is another important skill. What to speak, how to speak, when to speak and whom to speak are essential elements. Communicator should have updated knowledge and it should be scientifically sound and meaningful.

C. **Reading:** It means acquiring the latest knowledge on health development, different health policies and also to inform people what services are available for them by the Government facilities.

D. **Writing:** It means developing clear and precise messages on health and other issues in local language for easy understanding. Clear and concise written job descriptions of all levels of health functionaries.

CM1.10: Demonstrate the important aspects of the doctor patient relationship in a simulated environment.

Doctor is bound by medical ethics of Hippocratic oath, Nuremberg code of ethics in medical research, Helsinki declaration and duties of physician toward their patients as per the National Medical Commission (NMC). As per Indian Public Health Standards, a sub-center catering a population 5,000 usually. The providers of public health services are connected with community.

The new MBBS curriculum has a course called attitudes, ethics, communication **(AETCOM)**. It has 27 modules of 140 hours for the period of 4 years. The medical college faculty must practice it first of all. AETCOM must be integrated with different phages—pre, para and clinical courses. Approaches are clinico-social case review, problem-based learning, etc. **Ethics in medicine:** Ethics is the branch of philosophy dealing with the distinction between right and wrong with the moral consequences of our actions. It also refers to moral issues involved in statistical investigations in medicine, the scientific integrity of the investigator and obligations implicit in the doctor-patient relationship. Doctor is the central stage bound by medical ethics of Hippocratic oath.

Nuremberg code of ethics in medical research: The voluntary consent of the human subject is absolutely essential.

Informed consent is the process of informing the potential participants about the proposed research in a systemic manner and empower them to take an informed decision to participate in research study.

- Understand study procedures and risks and benefits
- Get all questions and concerns answered
- Take a learned and informed decision to or not to participate

This process can be repeated several times during the research study if necessary.

Q22. Doctor patient relationship plays a vital role in care of disease.
(WBUHS, 2021; YSRUHSAP, 2023) **Doctor-patient relationship in a community** *(AKUB, 2024)*

Ans: By virtue of technical knowledge and skill, doctors exercise an authoritative role and issues order to the patient. A successful doctor is one who knows how well he/she can communicate with patient. There are three levels of communication:

1. **Communication on an emotional plane:** The doctor must give a sympathetic ear to the complaints made by the patient and their relatives.
2. **Communication on a cultural plane:** The doctor should be aware of the general concepts of culture and social organization of the community. The indigenous and folk systems (AYUSH) of medicine are successful in the rural areas because they are the part of total way of life of the community.
3. **Communication on an intellectual plane:** In general practitioners of modern medicine come from well-to-do families thus leaves a wide gap between the doctors and patient (illiterate masses) as well as creating a social distance. A successful doctor is one who reduces this gap, communicate with the patient freely and wins their confidence.

Thus, doctor patient relationship plays a vital role in care of disease.

SHORT NOTES AND RELEVANT QUESTIONS

Q23. Describe the meaning and concept of disease control, elimination, eradication and extinction with examples. *(WBUHS, 2015, 2016, 2019; TRUHS, 2023; BNMUB, 2013, 2020; BUMP, 2008; SMUHSA, 2011; RUHP, 2010; SMU, 2012, 2013; DU, 2009; NU, 2011, 2017; GNMUB, 2023; SDUPS, 2024)*

Ans:

Issues	Meaning and concept with examples
Control	In disease control, the agent persists in the community at a level it is no longer a public health problem. A state of equilibrium becomes established between disease agent, host and environment component of disease process. It focuses on primary and secondary prevention. **Example** can be cited as control of malari control of filaria, etc.
Elimination	Disease elimination is between control and eradication. It is better to say "regional elimination." The term elimination is used to describe the interruption of transmission of diseases. Certain diseases are targeted for elimination like neonatal tetanus, measles and diphtheria. Several strategies are adopted for elimination of certain diseases under different national programs. Regional elimination is now seen as an important precursor of eradication. Guinea worm disease, poliomyelitis have been eliminated from our country.
Eradication	Eradication means, **"tearing out from root".** On the other hand, eradication implies termination of all transmission of infection by extermination of infectious agents. It is an absolute process. It is all or none phenomenon. The disease has passed through all stages of control, elimination and eradication. No patient of smallpox is seen in the world at present and WHO declared its eradication in early eighties of last century. This is an absolute term considering globe, no germ found in the environment, no suffering from the disease for long time. Smallpox had already been eradicated from the globe. **It is very important to note that the smallpox virus has not been completely destroyed. Stocks are still held Government Research centers in the Russian Federation and United States of America.**
Extinction	A situation in which something no longer exists. The extinction of the dinosaurs occurred millions of years ago. Many species of plants and animals are in danger of/threatened with extinction (being destroyed so that they no longer exist). Some people predict the extinction of family life as we know it today.

Q24. Write down the different disability rates with example.

(WBUHS, 2015; DU, 2009; NU, 2011, 2017; GOAU, 202

Ans: Disability rates: *(DU, 2013; RGUHS, 2013, 201*

To supplement morbidity and mortality indicators, disability rates have come in the scene. This is th proportion (percentage) of population unable to perform the expected, routine daily activities due to injur or illness. Different disability rates are the number of days of restricted activities, bed disability days, an work loss days as event type indicators and confined to bed, confined to house, limitation to perform th basic activities of daily livings are person-type indicators.

Examples of disability rates:

Sullivan's index *(RGUHS, 2010, 2012; TDMGRMU, 2011, 2015; NIMSUR, 2015)*: This index is calculated b subtracting the duration of bed disability (whole life) from the expectation of life at birth. Say, average life expectancy of a female 64.5 years and she suffered from disability for 7.5 years, then Sullivan's index will b (64.5-7.5) years = 57 years.

Health adjusted life expectancy (HALE): This is taken as years. It is number of years a newborn is expected to live in full health based on current morbidity and mortality.

Other examples: DALY and DFLE.

Q25. DALY.

(WBUHS, 2014, 2017; ABKUB, 2015, 2017; RUJH, 2022; TDMGRMU, 201 2014; SMU, 2012; KIMS, 2019; ABKUB, 2023; MU, 2023

Ans: DALY is the abbreviated form of **Disability Adjusted Life Years.** This is the number of years lost in the healthy life of an individual due to disability. DALY measures the burden of disease in a population and effectiveness of intervention.

In recent years, DALY as an indicator has been used globally to measure the burden of disease. This indicator is gaining reputation because of its capacity to measure mortality. One DALY is equivalent to "one lost year of healthy life."

DALY uses standardized maximum life expectancies (80 years in male and 82.5 years in women) which are considerably higher than the levels of life expectancy currently achieved in the developing countries. Using

these standardized life expectancies either in measuring the global burden of disease or cost-effectiveness analysis implicitly assumes that the health intervention alone are capable of achieving an increase in the life expectancy to higher levels. It is clear that many nonhealth circumstances will also need to change life expectancy to rise to the level used in the DALY calculation. They would include income, female education, improving water and sanitation condition, workplace safety, accidents and violence.

Hence, the burden that is measured by DALY is the burden of disease and underdevelopment and not that of disease alone.

Q26. Disability free life expectancy (DFLE). *(BNMUB, 2014)*

Ans: Disability is an inability to perform expected social roles within a given environment.

Both length of nondisabled life and total life expectancy have become important and useful indicators of population well-being. Disability free life expectancy is increasing in developed countries like USA, France, and England.

Multistate life table model is used to assess the disability free life expectancy. This modeling approaches provide a wealth of summary information, such as the length of disabled life, the ways in which the transition rates determine the disabled life expectancy, and the future structure of population disability if current transition rate of disability onset and recovery continue indefinitely.

Disability free life expectancy (DFLE) is the average number of years an individual is expected to live free of disability if current pattern of mortality and disability continue to apply. Disability free life expectancy is also known as active life expectancy.

Q27. What is disability limitation *(WBUHS, 2015)* **or concept of disability?**
(RGUHS, 2009; TDMGRMU, 2014; TRIU, 2024; MGUB, 2024)

Ans. Concepts of disability limitations: Sequence of events in disease may be recovery or death or recovery with complication(s), i.e., disability.

Disability is inability to perform certain routine and expected activity considered normal for that age, sex in good health. This is often the sequel of a disease or an accident. So, disability limitation is an intervention to halt further worse condition of the diseased person, thus intervention may be intensive or aggressive treatment.

Example: Disease or disorder (accident) produces impairment (loss of foot) which leads to disability (unable to walk). This disability may lead to handicap of the individual (discharge from employment or unable to work). The limitation of disability will be possible in diseased individual to stop further problem.

Q28. What is the dependency ratio? *(WBUHS, 2024; ABKUB, 2016; RUJH, 2012)*

Ans: It is the ratio between the adults, who are in the age of economically productive life, 15–65 years and the dependents such as children below 15 years and elderly above 65 years. It is expressed per 100 adults. Young age dependency ratio is considered when 0–14 years children are taken. Old age dependency ratio when above 65 years people are considered.

$$\textbf{Total dependency ratio} = \frac{\text{Children 0–14 years + Population of above 65 years}}{\text{Population of 15–65 years}} \times 100$$

An increase in dependency ratio will affect the economic and social burden of the country. The old age dependency ratio was 7.7 percent during 2001 and increased to 8.1 percent in 2011 and is on the increase.

Q29a. What is rehabilitation? *(BNMUB, 2010, 2012; VKSUAB, 2018; YSRUHSAP, 2016; TDMGRMU, 2008, 2009; ABKUB, 2013; BUMP, 2008; SMU, 2014; NU, 2013)*

Ans: Rehabilitation can be defined as combined and coordinated use of medical, social, educational and vocational measures for training and retraining the individual to the highest possible level of functional ability. It includes all measures aimed at reducing the impact of disabling and handicapping conditions and enabling the disabled and handicapped to achieve social integration.

Rehabilitation involves different disciplines at the same time in different combination such as phy medicine or physiotherapy, occupational therapy, speech therapy, audiology, psychology, educa vocational guidance and placement services.

The following areas of concern in the rehabilitation has been identified:

- Medical rehabilitation performs restoration of function. Reconstructive surgeries in leprosy, provisio aids for the crippled are medical rehabilitation.
- Vocational rehabilitation performs restoration of the capacity to earn a livelihood. Establishing sch for the blind, muscle reduction or graded exercise in neurological disorder, changes of profession f most suitable one are examples of vocational rehabilitation.
- Social rehabilitation performs restoration of family and social relationship through re-employment.
- Psychological rehabilitation performs restoration of personal dignity and confidence.
- Purpose of the rehabilitation is to make productive people out of nonproductive people.

It is now recognized that rehabilitation is a difficult and demanding task that seldom gives tot satisfactory results but needs enthusiastic cooperation from different segments of society as well as **expertis equipment and funds not readily available for this purpose even in affluent societies.**

Q29b. Describe social rehabilitation. *(BNMUB, 2004; SAMU, 20*

Ans: Social rehabilitation means restoration of family and social relationship. It is particularly important diseases of social stigma, like leprosy, HIV, mental illness, etc.

Purpose: Social rehabilitation is adopted to make productive people out of nonproductive people.

Q29c. Explain briefly vocational rehabilitation. *(BNMUB, 20*

Ans: Vocational rehabilitation means restoration of capacity to earn a livelihood, so that the person remains becomes an economically productive person. **For example,** suppose after a road traffic accident any pers loss one foot, so he/she cannot drive and temporarily may become a jobless and economically depende person. But if any alternative job like clerical job is offered to him/her and recruited in this new post, vocation rehabilitation can be done.

Q30. Describe the principle of prevention. *(BNMUB, 2016, 20*

Ans: Principle of prevention mostly depends upon:

- Knowledge of causation
- Dynamics of transmission
- Identification of risk factors and risk groups
- Availability of prophylactic or early detection and treatment measures
- Need for appropriate organization/groups/person for applying these measures
- Continuous evaluation of procedure applied.

The objective of prevention is to intercept or oppose the cause as well as disease process. Sometimes it wa observed that removal or elimination of a single known essential cause may sufficient to prevent a disease

Afterwards, describe four levels of prevention from Q.14

Q31. Justify the role of healthy lifestyle in promotion of health. Give two examples of lifestyle factor that promote health and two examples that cause disease. Describe how can you influence lifestyle change that promote health. *(RGUHS, 2003; SMU, 200*

Ans: *Role of healthy lifestyle in promotion of health:*

- Health requires promotion of healthy lifestyle.
- It is composed of cultural and behavioral patterns and personal habits developed through the process of socialization, i.e., learnt through social interaction with parents, peer groups, friends, and siblings and through school and mass media.

- Lifestyle pattern in developing countries like poor nutrition, lack of sanitation, poor personal hygiene, customs and cultural patterns are the risk factors for illness and also death.
- Due to lifestyles in developed countries prevalent health problems are obesity, coronary heart disease, lung cancer and drug addiction, etc.
- All lifestyle factors are not harmful, examples are adequate nutrition, enough sleep, and sufficient physical activity may promote health.
- So, in conclusion, adoption of healthy lifestyle helps to achieve promotion of health.
- **Lifestyle factor promoting health:** Adequate nutrition, physical exercises, meditation, etc.
- **Lifestyle factors causing disease:** Use of alcohol, drugs, tobacco, sedentary lifestyle, etc.
- **Importance:** Change of lifestyles promotes health through health education, a holistic approach.

Q32. What is prevention of disease? *(BNMUB, 2015)*/**What are the levels of prevention?**
(WBUHS, 2008; TRIU, 2016; TDMGRMU, 2011; SSUHSA, 2008; SMU, 2012; KIMS, 2015, 2017; DU, 2013; NU, 2013; MGUB, 2024)

Ans: Primordial prevention: This is prevention of population groups from risk factors which have not yet appeared. Obesity in childhood, when lifestyles are formed (eating habits, smoking and physical exercise) can be prevented in the community. Efforts are directed toward discouraging children from adopting harmful habits/lifestyles. The main intervention is through mass education. The prevention of hypertension, diabetes mellitus thus will be exercised in reducing the obesity.

Other three levels of prevention:
1. Primary prevention
2. Secondary prevention
3. Tertiary prevention
Construct the remaining part of the answers from long essay Q.14

Q33. Describe primordial prevention. *(BNMUB, 2014; ABKUB, 2018; TRIU, 2016; TDMGRMU, 2011, 2012; SSUHSA, 2011; SMU, 2015)*/**Primordial prevention is a subset of primary prevention only—Justify.**
(WBUHS, 2015; RGUHS, 2024)

Ans: Primordial prevention: This is prevention of population groups from risk factors which have not yet appeared. Obesity in childhood, when lifestyles are formed (eating habits, smoking and physical exercise), can be prevented in the community. Efforts are directed toward discouraging children from adopting harmful habits/lifestyles. The main intervention is through mass education.

Thus, the prevention of hypertension, diabetes mellitus thus will be exercised in reducing the obesity.

The diseases are prevented before disease develops in any individual. This prevention level is truly primary prevention where disease development will be prevented. Primordial prevention is also trying to fulfill the same objective.

So, primordial prevention is a subset of primary prevention.

Q34. Explain early diagnosis and treatment are the main intervention of disease control.
(BNMUB, 2014)

Ans: The earlier a disease is diagnosed and better treatment and good prognosis, preventing the occurrence of secondary cases or any long-term disability. It is like stamping out the **"spark"** rather than calling the fire brigade to put out of fire. Early diagnosis and treatment though not as effective and economical as primary prevention may be critically important in reducing the high morbidity and mortality in certain diseases like essential hypertension, cancer cervix, breast cancer, tuberculosis, leprosy and STD etc., early diagnosis and treatment are only effective mode of intervention. Early effective therapy shortens period of communicability and reduce the mortality from acute communicable diseases i.e., early recovery and no further secondary case.

So, early diagnosis and treatment are the main intervention of disease control.

Q35. What is iceberg phenomenon of a disease? *(WBUHS, 2008, 2017, 2019, 2023; MGUB, 2022; ABK... 2022, 2023; BNMUB, 2022; YSRUHSAP, 2015; RGUHS, 2010, 2013; TRJU, 2015, 2020, 2021; SAMU, 20... TDMGRMU, 2010, 2014; SMU, 2012, 2014; DU, 2012; NU, 2014, 2015; SSUHSA, 2017, 2023; KIM...*
Explain sub-merged/hidden part of the iceberg has immense importance to an epidemiologis...
(WBUHS, 2009, 2022; ABKUB, 2023) **Latent infection, inapparent infection and subclinical infe... with examples in the context of iceberg phenomenon** *(VBUIH, 2022; VNSG...*

Ans: The iceberg of disease is closely related to spectrum of disease. The disease of the community is com... with an iceberg. The floating tip of the iceberg represents what physician sees in the community (... case). The vast submerged portion of iceberg represents the hidden mass of disease, i.e., latent, inapp... presymptomatic and undiagnosed cases and carriers in the community. The waterline represe... demarcation between apparent and inapparent disease. In some diseases (e.g., hypertension, dia... anemia, malnutrition and mental illness), the unknown morbidity (submerged portion of iceberg) far ex... known morbidity (floating tip). The hidden part of iceberg thus constitutes an important undiag... reservoir of infection or disease in the community. Its detection and control is a challenge to modern me... **(Fig. 1.3)**

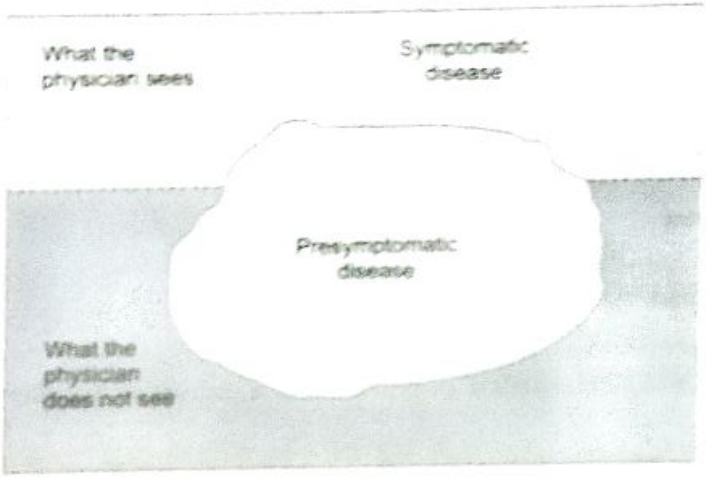

Fig. 1.3: Iceberg of disease

Q36. What are disease dynamics? *(BUMP, 20...*

Ans: Health is a dynamic state of well-being characterized by a physical, mental and social state, which satis... the demands of a life commensurate with age, culture, and personal responsibility.

Q37. Quality of life. *(WBUHS, 20...*

Ans: It is defined as a composite measure of physical, mental and social well-being as perceived by each indivi... or group of individuals. Governments (all over the world) are concerned about improving the quality of l... by reducing morbidity, mortality, improved primary healthcare and enhancing physical, mental and so... well-being. For measuring physical quality one such index used as PQLI is frequently utilized. Indicators... PQLI are infant mortality, life expectancy at age one and literacy rate. PQLI is independent of per capita G...

Q38. What is PQLI? *(RGUHS, 2011, 2013, 2014, 2015; ABKUB, 2006, 2023; PBDSUHSH, 20... YSRUHSAP, 2017; VKSUAB, 2020; TDMGRMU, 2010, 2014; KIMS, 2021; SAMU, 20... BUMP, 2013, 2020; SMU, 2012, 2014; DU, 2010; NIMSUR, 2015; NU, 2012; SDVPG, 20... MGUB, 2023, 2024; BNMUB, 2023; VBUIH, 20...*

Ans: PQLI stands for Physical Quality of Life Index. Three indicators are being used to determine the PQLI. They are **infant mortality, life expectancy at age one and literacy**. The performance of each country is expresse...

in 0–100 scale, where 0 denotes absolutely worst performance and 100 denotes best performance. By averaging the three indicators the composite index is being calculated, giving equal weightage to each of them. **The resulting PQLI thus also is scaled 0–100.**

Per capita GNP is not considered for determining the PQLI. For example, the Middle East (Oil rich countries) is with high per capita incomes but with a very low PQLI. On the other hand, Kerala, the state of India, with lower per capita income have high PQLI.

So, PQLI does not represent economic growth rather it is the results of social, economic and political policies. **The ultimate objective is to attain a PQLI of 100.**

Q39. What is human development index [HDI]? *(WBUHS, 2011, 2022; BNMUB, 2022; ABKUB, 2018, 2022; VKSUAB, 2018; PBDSUHSH, 2013, 2017; SAMU, 2022; RUJH, 2009; RGUHS, 2013, 2015; TDMGRMU, 2010, 2016; KIMS, 2015; DU, 2012; SDVP, 2023; VNSGUS, 2023)*

Ans: The Human Development Index (HDI) is a composite index combining three indicators. **There are three dimensions of HDI—longevity (life expectancy at birth), educational attainment as knowledge (adult literacy rate and mean years of schooling) and income (real GDP per capita in purchasing power-parity dollars).** The concept of HDI really reflects the achievement of basic needs (capabilities) leading to a long, healthy, knowledgeable life with a decent standard of living. Income is only a means to human development, not an end, nor is it a sum total of human lives. HDI provides a more comprehensive picture of human life than income does. **This HDI can be calculated, and its value ranges from 0 to 1**. This value can be utilized in international comparisons.

To construct the index, for each of these components minimum and maximum values have been established and their summation will be treated as HDI. Depending upon the value of HDI, the countries can be graded in different levels. The different grades are 'low' with HDI value <0.5, 'medium' with HDI value 0.79 to 0.5 and 'high' with value ≥0.8. **HDI of India is 0.645 (Rank 131 out of 189 countries) [Human Development Report, UNDP, 2019].** High category countries are Norway, Australia, United States of America, etc.

Differences between PQLI and HDI

Points	PQLI	HDI
Components	Infant mortality	Income (GDP per capita in purchasing power parity in US dollars)
	Life expectancy at age one	Longevity-life expectancy at birth
	Literacy rate	Knowledge (adult literacy and mean years of schooling)
Range	0–100	0–1
Value of India	65	0.645

Q40. Describe global hunger index (GHI). *(ABKUB, 2019, 2023; SAMU, 2015)*

Ans: The Global Hunger Index [GHI] is a multidimensional statistical tool used to describe the state of countries' hunger situation. The GHI measures progress and failures in the global fight against hunger. The GHI is updated once a year.

It shows that the world has made progress in reducing hunger since 2000, but still has a long way to go, with levels of hunger still serious or alarming in 50 countries. This year's report hails a new paradigm of international development proposed in the United Nations' 2030 Agenda for Sustainable Development, which envisages Zero Hunger by 2030, as one goal among 17, in a holistic, integrated, and transformative plan for the world.

Calculation of the index: The index ranks countries on a 100-point scale, with 0 being the best score (no hunger) and 100 being the worst, although neither of these extremes is reached in practice. Values less than 10.0 reflect low hunger, values from 10.0 to 19.9 reflect moderate hunger, values from 20.0 to 34.9 indicate serious hunger (Pakistan), values from 35.0 to 49.9 reflect alarming hunger (Zambia), and values of 50.0 or more reflect extremely alarming hunger levels.

The GHI combines four component indicators: (1) the proportion of the undernourished as a perc... the population; (2) the proportion of children under the age of five suffering from wasting; (3) the pr... of children under the age of five suffering from stunting; (4) the mortality rate of children under the ag...

Q41. What is the human poverty index (HPI)? *(ABKU...*

Ans: The human poverty index (HPI) was introduced in 1997 by the United Nations Development Program... It measures deprivation in the basic dimensions of human development like longevity, knowledge, s... of living/income. HPI is complementary to the human development index (HDI). In 2010, it was supp... (replaced) by the UN's Multidimensional Poverty Index.

The HPI concentrates on the deprivation in the three essential elements of human life already re... in the HDI: longevity, knowledge and a decent standard of living. The HPI is derived separat... developing countries (HPI-1) and a group of select high-income Organization for Economic Coop... and Development (OECD) countries (HPI-2) to better reflect socioeconomic differences and also the ... different measures of deprivation in the two groups.

Q42. What are well-being and wellness? *(ABKUB, 2019; GITAMA...*

Ans: Psychologists have pointed out that the well-being of an individual or group of individuals have obj... and subjective components.

The objective components related to standard of living and level of living and subjective comp... related to quality of life.

Standard of living includes level of education, employment status, food, dress, house, amusement ... comfort of modern living.

Level of living has got nine components viz, health, food consumption, education, occupation and wo... conditions, housing, social security, clothing, recreation and leisure, and human rights.

Quality of life can be evaluated by assessing a person's subjective feelings of happiness or unhapp... about the various life concerns.

Wellness of an individual is a subjective phenomenon. It is range from positive health, better healt... freedom from sickness.

Q43. What are healthy lifestyles? *(WBUHS, ...*

Ans: Maintenance of a healthy lifestyle is required to maintain good health, and this is a good actio... example of health promotion. As the age advances, problems of communicable disease begin to de... due to advancement in chemotherapy, vector control, immunization, etc., but various types of lifes... related noncommunicable and chronic diseases are increasing like hypertension, diabetes, cardiovas... diseases, mental illness, accident, etc. If the healthy lifestyles are adopted by majority of the populatio... will substantially reduce morbidity and mortality from various noncommunicable and chronic disease...

A healthy lifestyle should promote health and never cause harm. Examples of healthy lifestyles inc... avoidance of tobacco smoking, regular physical activity (at least 30 minutes/day) like running, fast walk... swimming, playing, etc. Consumption of alcohol should be reduced as much as possible. Low consump... of fatty food and junk food, regular consumption of fruits and vegetables are good practice in relatio... food. Maintenance of body weight, maintenance of personal and genital hygiene, use of protective de... during driving and driving at low speed, adequate rest and sleep, avoidance of regular late night, etc... other important issues as healthy lifestyle for health improvement.

Q44. Explain lifestyle and healthy ageing. *(SSUHSA, 2016; MU...*

Ans: Adopting healthy lifestyle, the risk of a whole range of disease can be reduced in later life by paying care... attention to lifestyle factors. These factors are as follows:

- **Diet and nutrition:** Healthy diet reduces the chances of developing the diseases in the old age. Saturat... and trans fatty acids have been linked to raised cholesterol levels in blood, leading to increased ris... cardiovascular diseases. Hence, the diet should be balanced with less saturated fats and oils, contain...

of fruits and vegetables, salt and sugar should be less, should contain high fiber and plenty of calcium rich food like milk, etc.

- **Exercise:** It helps in maintain good health, as it helps to control weight, improves emotional well-being and relieves stress, improves blood circulation, lower blood pressure, increases flexibility, increases energy level, lower blood sugar level thus helps in controlling diabetes, improve bone density, helps to prevent osteoporosis.
- **Weight:** Overweight and obesity have become major problems worldwide contributes to many diseases in later life. Obesity is an important factor in heart disease, stroke, hypertension, diabetes, arthritis and breast cancer.
- **Smoking:** It is estimated that 22% of men and 18% of the women aged 65–74 years in developed countries are smokers. Former smokers live longer than continuing smokers, smoking cessation at the age of 50 years reduces the risk of dying within the next 15 years by 50%.
- **Alcohol:** Older people achieve a higher blood alcohol concentration than younger people after consuming an equal amount of alcohol. It is linked to liver disease, stomach ulcers, gout, depression, osteoporosis, heart disease, breast cancer, diabetes and hypertension.
- **Social activities:** Mixing with other people of similar age, at similar stage of life or perhaps with health concerns, can help people to realize that they are not alone. The support gained from others can be important in recovering from illness.

Q45. Describe family medicine. *(ABKUB, 2009; SMU, 2012)*/**Describe family physician.** *(WBUHS, 2018)*/**Role of primary physician in health** *(KIMS, 2023)*

Ans: Family medicine has been defined as "a field of specialization in medicine which is neither disease nor organ oriented". It is family-oriented medicine or health care centered on the family as the unit from first contact to the ongoing care of chronic problems. The recognition of family as a focal point of health care and right place for integrating preventive, promotive and curative services.

When these cares are being provided to patients and their families through application of the knowledge of family medicine then it is called family practice. The specialty of family practice is to deliver primary care.

Family physician: Family physicians, through education and residency training, possess distinct attitudes, skills, and knowledge which qualify them to provide continuing and comprehensive medical care, health maintenance and preventive services to each member of the family regardless of sex, age, or type of problem, be it biological, social.

Family physicians possess unique attitudes, skills and knowledge which qualify them to provide ongoing, comprehensive medical care to each member of the family. The cornerstone of family medicine is an ongoing, personal patient-physician relationship focused on integrated care.

Responsibilities: Family practice doctors, as primary care physicians, are often the first person whom a patient sees when seeking healthcare services. They examine and treat patients with a wide range of conditions and refer those with serious ailments to a specialist or appropriate facility.

Q46. Write the contribution to medical science of the following person:

a. Edward Jenner
b. Roland Ross
c. Louis Pasteur *(BNMUB, 2018)*
d. John Snow
e. James Lind *(GOAU, 2023)*

Ans: a. Edward Jenner, FRS FRCPE (17th May 1749–26th January 1823), was an English physician and scientist who was the pioneer of smallpox vaccine, the world's first vaccine. The terms "vaccine" and "vaccination" are derived from *Variolae vaccinae* (smallpox of the cow), the term devised by Jenner to denote cowpox. He used it in 1796 in the long title of his inquiry into the Variolae vaccinae known as the Cow Pox, in which he described the protective effect of cowpox against smallpox.

Jenner is often called "the father of immunology", and his work is said to have "saved more lives that work of any other human".

b. **Sir Ronald Ross** KCB KCMG FRS FRCS (13th May 1857–16th September 1932), was a British me doctor who received the Nobel Prize for Physiology or Medicine in 1902 for his work on the transmi of malaria, becoming the first British Nobel laureate and the first born outside Europe. His discovery of malarial parasite in the gastrointestinal tract of a mosquito in 1897 proved that malaria was transm by mosquitoes and laid the foundation for the method of combating the disease. He worked in the In Medical Service for 25 years. It was during his service that he made the groundbreaking medical discov After resigning from his service in India, he joined the faculty of Liverpool School of Tropical Medi and continued as Professor and Chairman of Tropical Medicine of the institute for 10 years.

c. **Louis Pasteur** (December 27, 1822 – September 28, 1895) was a French biologist, microbiologist a chemist renowned for his discoveries of the principles of vaccination, microbial fermentation a pasteurization. He is remembered for his remarkable breakthroughs in the causes and prevention diseases, and his discoveries have saved many lives ever since. He reduced mortality from puerperal fev and created the first vaccines for rabies and anthrax. His medical discoveries provided direct support f the germ theory of disease and its application in clinical medicine. He is best known to the general pub for his invention of the technique of treating milk and wine to stop bacterial contamination, a proce now called pasteurization. He is regarded as one of the three main founders of bacteriology, together wi Ferdinand Cohn and Robert Koch, and is popularly known as the "father of microbiology".

d. **John Snow** (1813–1858) was an English physician and a leader in the development of anesthesia an medical hygiene. He is considered one of the founders of modern epidemiology and early germ theory, part because of his work in tracing the source of a cholera outbreak in London, studied the epidemiolo of cholera in London from 1848 to 1854 and established the role of polluted drinking water in spread cholera.

He was one of the first physicians to study and calculate dosages for the use of ether and chloroform a surgical anesthetics, allowing patients to undergo surgical and obstetric procedures without the distres and pain they would otherwise experience. He designed the apparatus to safely administer ether to the patients and also designed a mask to administer chloroform. Snow published an article on ether in 184 entitled "On the Inhalation of the Vapor of Ether". A longer version entitled "On Chloroform and Othe Anesthetics and Their Action and Administration" was published posthumously in 1858.

e. **James Lind (1716–1794)** was a Scottish physician. He was a pioneer of naval hygiene in the Royal Nav By conducting one of the first ever clinical trials, he developed the theory that citrus fruits cured scurvy. He argued for the health benefits of better ventilation aboard naval ships, the improved cleanliness o sailors' bodies, clothing and bedding, and below-deck fumigation with sulfur and arsenic. He also proposed that fresh water could be obtained by distilling seawater. His work advanced the practice of preventive medicine and improved nutrition.

Scurvy is a disease caused by a vitamin C deficiency, but in Lind's day, the concept of vitamins was unknown. Vitamin C is necessary for healthy connective tissue. He was the first to study its effect by a systematic experiment in 1747. It was one of the first reported controlled clinical experiments in history, particularly because of its use of control groups.

Q47. Describe international classification of diseases [ICD]

(TRIU, 2013, 2016, TDMGRMU, 2010, 2012, SMU, 2014, DU, 2008, ABKUB, 2018; RUJH, 2021)

Ans: History of the ICD: The International Statistical Institute adopted the first international classification o diseases in 1893. The system was based on the Bertillon Classification of Causes of Death, developed by French statistician and demographer Jacques Bertillon. In 1898, the American Public Health Association recommended that Canada, Mexico and the United States use that system, revised in every decade. In the following years, Bertillon's classification became known as ICD.

International classification of diseases (ICD): In medicine, it is a diagnostic tool that is used to classify and monitor causes of injury and death and maintains information on health analyses such as the study o

mortality and morbidity trends. The ICD is designed to promote international compatibility in health data collecting and reporting. **After 1948, the World Health Organization (WHO)** assumed the responsibility for publishing the ICD and started collecting international data for all general epidemiological surveillance and health management purposes. In the year 1948, in its 6th revision the scope of ICD was expanded, henceforth it covered morbidity from illness and injury.

The World Health Organization introduced the international classification of diseases (ICD) in 1993 which has been accepted by national and international countries in the following years. **The latest 10th version was introduced on the 1st January 1993 by WHO. India has accepted this ICD 10 in 2000.** The ICD can be adapted for use of other field like dentistry, oncology and ophthalmology.

The core of the ICD-10 uses a single list of four-alphanumeric-character codes from A00.0 to Z99.0 except U. The first letter of the code designates a different chapter; there are 22 chapters in total (several letters are included in a single chapter together). Within each chapter, the four-character codes are divided so that they specify different classification axes. The fourth character (the number after the decimal) is not required for reporting and is used in various ways.

The ICD-11 is the eleventh revision of the International Classification of Diseases. A stable version of the ICD-11 was released on 18 June 2018 and officially endorsed by all WHO members during the 72nd World Health Assembly on 25 May 2019. It contains 55,000 unique codes for injuries, diseases and causes of deaths. 1st time, it is completely electronic-based and user-friendly format.

Unlike the ICD-10 codes, the ICD-11 mortality morbidity statistics (MMS) codes never contain the letters I or O to prevent confusion with the digital numbers 1 and 0.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. The definition of health given by the WHO includes all of the following, *except*: *(TRIU, 2023)*
a. Social b. Mental c. Physical d. Economic

2. Tridosha theory of disease is a concept of: *(YSRUHSAP, 2023)*
a. Greek medicine b. Indian medicine c. Chinese medicine d. Egyptian medicine

3. Which of the following concept of health recognized the strength of social, political and environmental influences on health: *(YSRUHSAP, 2023)*
a. Biomedical b. Psychosocial c. Ecological d. Holistic

4. The standard definition of public health is given by: *(ABKUB, 2019)*
a. Winslow b. Virchow c. Shattuck d. Chadwick

5. Often called father of public health: *(ABKUB, 2005)*
a. Hippocrates b. Sushruta c. Peter Hank d. Cholera

6. John Snow, who laid the foundations of science of epidemic investigation, was by profession: *(ABKUB, 2019)*
a. Epidemiologist b. Surgeon c. Lawyer d. Anesthesiologist

7. Investigation of cholera epidemic was done in London by: *(ABKUB, 2002)*
a. Edward Jenner b. James Lind c. Robert Koch d. John Snow

8. Role of polluted drinking water in spread of cholera was first studied by:
a. Edwin Chadwick b. John Snow c. Louis Pasteur d. Edward Jenner

9. Theory of web causation was given by: *(ABKUB, 2018)*
a. MacMahon and Pugh b. Pettenkofer c. John Snow d. Louis Pasteur

10. James Lind is known for: *(AFUH, 2022)*
a. Germ Theory of Disease
b. Multifactorial causation of diseases
c. Prevention of scurvy by citrus fruits
d. Web of Causation

11. Iceberg phenomenon differentiates: *(ABKUB, 2*
a. Apparent and Inapparent
b. Symptomatic and Asymptomatic
c. Cases and Carriers
d. Diagnosis and Undiagnosed

12. HDI includes: *(ABKUB, 2018; AKUB, 2*
a. Infant mortality, life expectancy and literacy
b. Maternal mortality, life expectancy and literac
c. Disability rate, pregnancy rate and GNP
d. Longevity, knowledge and income

13. Which is not an indicator of Human Development Index? *(SAMU, 20*
a. Life expectancy at birth
b. Life expectancy at age 1
c. Knowledge
d. Income

14. All of the following are determinants for the essential components to calculate Physical Quality of Li Index (PQLI), *except*: *(ABKUB, 20*
a. Infant mortality rate
b. Life expectancy at age 1 year
c. Basic literacy rate in population
d. Life expectancy at birth

15. The physical quality of the life index considers all, *except*: *(ABKUB, 20*
a. Expectancy of life at birth
b. Expectancy of life at age one
c. Infant mortality rate
d. Literacy rate

16. Physical quality of life index includes all, *except*: *(ABKUB, 20*
a. Infant mortality
b. Life expectancy at age one
c. Literacy
d. GDP per capacity

17. All of the following components are measured in PQLI, *except:* *(ABKUB, 202*
a. Life expectancy at age 1
b. Infant mortality rate
c. Income
d. Literacy rate

18. Living standard of people is best assessed by: *(TRIU, 202*
a. Infant mortality rate
b. Maternal mortality rate
c. Physical quality of life index
d. Death rate

19. Life expectancy is given by: *(ABKUB, 202*
a. Average number of years a person is expected to live according to the mortality pattern prevalent in th region
b. Average number of years a person spends in good health free from diseases
c. Average number of live births in an area during a particular year
d. Total number of years a person is expected to live including those with disease and disability

20. The health indicator that measures the overall disease burden expressed as the number of years los due to ill-health, disability or early death is: *(YSRUHSAP, 202*
a. Health adjusted life expectancy (HALE)
b. Quality adjusted life years (QALY)
c. Disability free life expectancy (DFLE)
d. Disability adjusted life years (DALY)

21. A useful index to measure the lethality of an acute infectious disease is: *(VKSUAB, 202*
a. Attack rate
b. Incidence
c. Case fatality rate
d. None of the above

22. Virulence of a disease is indicated by: *(ABKUB, 201*
a. Proportional mortality rate
b. Specific mortality rate
c. Case fatality rate
d. Amount of GDP spent on the disease

23. Virulence of a disease is indicated by: *(AFUH, 202*
a. Proportional mortality rate
b. Specific mortality rate
c. Case fatality rate
d. Amount of GDP spent on disease

24. "Tear out from roots" is used to define: *(GITAMAP, 2023)*
a. Disease control b. Disease elimination c. Disease prevention d. Disease eradication

25. Causative agent is present but there is no transmission, is known as: *(ABKUB, 2018; WBUHS, 2023)*
a. Elimination b. Control c. Eradication d. Holoendemic

26. Rehabilitation has the following components, *except*:
a. Social b. Psychological c. Medical d. Surgical

27. Yoga is considered a part of modern medicine. It will be a part of: *(ABKUB, 2018)*
a. Physiotherapy b. Preventive medicine c. Therapeutic medicine d. Caloric medicine

28. Disability limitation is a mode of intervention for: *(AFUH, 2022)*
a. Primordial intervention b. Primary prevention
c. Secondary prevention d. Tertiary prevention

29. Pap smear test for detection of carcinoma of cervix is which level of prevention? *(ABKUB, 2018, 2021)*
a. Primordial b. Primary c. Secondary d. Tertiary

30. After excision of breast for Ca breast, a surgical reconstruction of breast tissue was done. This is: *(ABKUB, 2020)*
a. Primary prevention b. Secondary prevention c. Tertiary prevention d. Medical treatment

31. When a child lost his hands and unable to do routine works called as: *(ABKUB, 2018)*
a. Handicap b. Disability c. Impairment d. Battered-baby syndrome

32. A person who has lost his foot in an accident and is not able to walk is an example of: *(ABKUB, 2018; WBUHS, 2023)*
a. Disease b. Disability c. Impairment d. Handicap

33. A good indicator of the availability, utilization and effectiveness of health care services in a country is: *(MGUB, 2023, 2024)*
a. Maternal mortality rate b. Hospital bed occupancy rate
c. Infant mortality rate d. Disability adjusted life years (DALYs)

34. The inability to carry out certain functions or activities, which are otherwise expected for that age/sex is known as: *(MGUB, 2023, 2024)*
a. Disease b. Disability c. Handicap d. Impairment

35. All of the following interventions fall under primary prevention, *except*: *(SSUHSA, 2023)*
a. Health education b. Hearing aid
c. Covid vaccination d. Smoking cessation program

36. The purpose is to limit the incidence of disease by controlling causes and risk factors: *(RUJH, 2023)*
a. Primordial prevention b. Primary prevention
c. Secondary prevention d. Tertiary prevention

37. Which constitutes the denominator in total dependency ratio? *(RUJH, 2023; AKUB, 2024)*
a. Population 15–45 years of age b. Mid-year population
c. Population of 15–65 years d. Population less than 14 years and more than 65 years

38. Which is the following system of medicine is of Indian origin: *(GOAU, 2023)*
a. Homeopathy b. Siddha c. Unani-Tibb d. Accupuncture

39. Disease elimination means: *(ABKUB, 2023)*
a. Cure of the disease b. Preventing the transmission totally
c. Eradication of the vector d. Complete termination of infective organism

40. Disease elimination refers to: (AFUH, 2...)
a. Extinction of disease agent
b. Termination of all disease
c. Global removal of disease agent
d. Regional removal of disease agent

41. Iceberg phenomenon is seen in all, except: (TRU, 2...)
a. Leprosy b. Rabies c. Hypertension d. Tuberculosis

42. Tip of Iceberg Phenomenon is most appropriately represented by: (AFUH, 2...)
a. Malaria
b. Measles
c. Protein Energy Malnutrition
d. Rabies

43. Submersed portion of Iceberg of disease phenomenon indicate? (RUJH, 2...)
a. Latent b. Asymptomatic c. Sub-clinical d. All the Options

44. Which of the following is the most logical sequence? (AFUH, 2...)
a. Impairment-Disease-Disability-Handicap
b. Disease-Impairment-Disability-Handicap
c. Disease-Impairment-Handicap-Disability
d. Disease-Handicap-Impairment-Disability

45. Disability adjusted life year (DALY) expresses the: (GOAU, 2023; AKUB, 2...)
a. Extent of disability in the population
b. Expectation of life free of disability
c. Years of life adjusted to disability death and disability
d. Loss of year of life due to premature death and disability

46. In a doctor-patient relationship which of the following is not a level of communication? (VBUJH, 2...)
a. Communication on an emotional plane
b. Communication on an intellectual plane
c. Communication on a psychological plane
d. Communication on a cultural plane

47. In Calculating Dependency Ratio the numerator is expressed as: (GNSUB, 2...)
a. Population under 10 years and 65 and above
b. Population under 15 years and 65 and above
c. Population under 10 years and 60 and above
d. Population under 15 years and 60 and above

48. Sanjay Gandhi Niradhar Yojana is an example of: (KIMS, 2...)
a. Social insurance b. Social assistance c. Personal insurance d. Group insurance

49. National Iron Plus Initiative (NIPI) is an example of which level of prevention? (AFUH, 2...)
a. Primodial b. Primary c. Secondary d. Tertiary

50. Chemoprophylaxis is _____ preventive type: (ABKUB, 2...)
a. Primary b. Secondary c. Tertiary d. Quaternary

51. Which of the following is the tertiary level of prevention (TRIU, 2...)
a. Health promotion
b. Specific protection
c. Early diagnosis and treatment
d. Disability limitation

52. Which of the following components are considered while calculating Human Development Index? (KIMS, 2...)
a. Life expectancy at birth
b. Infant mortality rate
c. Adult literacy rate
d. Purchasing power parity dollars

53. Human development index comprises of the following except: *(KIMS, 2024)*

a. Education (mean years of schooling and expected years of schooling)
b. Gross national income per capita
c. Life expectation at birth
d. Infant mortality rate

54. Physical quality of life has which of the following indicators (select correct combination) *(RUJH, 2024)*

Infant mortality rate
Life expectancy at birth
Literacy
Per capita income
Mean years of schooling
Life expectancy at age 1

a. 1, 2, 3 b. 1, 4, 5 c. 2, 3, 6 d. 1, 3, 6

55. Physical quality of life index (PQLI) includes the following parameters: *(AKUB, 2024)*

a. Infant mortality rate, per capita calorie intake and life expectancy
b. Infant mortality rate, life expectancy at 1 year and literacy
c. Infant mortality rate, maternal mortality rate and life expectancy
d. Infant mortality rate, life expectancy at birth and literacy

56. The main difference between BCC and IEC is that: *(DBRAUA, 2024)*

a. BCC is target oriented regarding a target group, target disease and target behavior
b. BCC uses only the mass media, such as TV
c. BCC strategy is used only when the IEC strategy has failed
d. BCC is undertaken only for HIV/AIDS

57. Tendon reconstruction surgery in polio is which type of rehabilitation? *(WBUHS, 2024)*

a. Social b. Medical c. Vocational d. Educational

Answers:

1.	d	**2.**	b	**3.**	d	**4.**	a	**5.**	d	**6.**	a	**7.**	d	**8.**	b	**9.**	a	**10.**	c
11.	b	**12.**	d	**13.**	b	**14.**	d	**15.**	a	**16.**	d	**17.**	c	**18.**	c	**19.**	a	**20.**	d
21.	c	**22.**	c	**23.**	c	**24.**	d	**25.**	a	**26.**	d	**27.**	b	**28.**	d	**29.**	c	**30.**	c
31.	a	**32.**	b	**33.**	b	**34.**	b	**35.**	b	**36.**	b	**37.**	c	**38.**	b	**39.**	b	**40**	d
41.	b	**42.**	c	**43.**	d	**44.**	b	**45.**	d	**46.**	b	**47.**	b	**48.**	b	**49.**	b	**50.**	a
51.	d	**52.**	a	**53.**	d	**54.**	d	**55.**	b	**56.**	a	**57.**	b						

FILL IN THE BLANKS WITH APPROPRIATE WORD(S)

1. _____ is an English epidemiologist established the role of polluted drinking water in the spread of cholera. *(VKSUAB, 2016)*
2. PQLI is a composite index consisting of _____ *(SAMU, 2012)*
3. DALY is a _____ indicator [DALY - Disability-Adjusted Life Years]. *(KIMS, 2017)*
4. _____ is defined as the number of units of a country's currency required to buy the same amount of goods and services in the domestic market as one dollar would buy in the USA. *(KIMS, 2015)*

Answers:

1. John Snow
2. Infant Mortality Rate, Life Expectancy at Age 1 (One) and Literacy
3. Disability
4. Purchasing Power Parity

TRUE OR FALSE

Tick the correct answers (True or False)

1. Hippocrates is the father of modern medicine. *(SAMU, 2*
2. DALY is a mortality indicator. *(SAMU, 2*
3. Prevention of childhood obesity is an example of health promotion. *(SAMU, 2*
4. Nutritional rehabilitation is an example of secondary prevention. *(SAMU, 2*
5. Measures to reduce injuries for the geriatric age group is a type of primary prevention. *(SSUHSA, 2*

Answers:

1. True
2. False
3. True
4. False
5. True

CHAPTER

2

Relationship of Social and Behavioral Sciences to Health and Disease

CM2.2: Describe the family types, its role in health and disease.

Q1. Enumerate the types of family. Describe the stages of family cycle; discuss the role of family in health and disease. *(WBUHS, 2010; TRIU, 2022; BNMUB, 2002; ABKUB, 2021; VKSUAB, 2021; SMU, 2014; SSUHSA, 2013, 2017; KIMS, 2019, 2021; SDVPG, 2023; MGUB, 2023)*

Ans: The family is a primary unit in all societies. **It is a group individuals related biologically or by marriage or by adoption, living together and sharing a common kitchen.**

As a biological unit, the family members share a pool of genes. As a social unit, they have a common physical and social environment. As a cultural unit, the family reflects the culture of the wider society of which it forms a part and determines the behavior and attitude of its members.

Types of family *(SSUHSA, 2023: ABKUB, 2023; AFUH, 2023)*

The **types of family** are as follows:

Nuclear family: *(RUJH, 2018)*

It consists of married couple and their dependent children. They tend to occupy the same dwelling space. In the nuclear family, husband usually plays a dominant role in the household in our society. This is also called elementary family.

Joint family: *(WBUHS, 2019; DU, 2016; RUJH, 2018; KIMS, 2021)*

This is a kind of family grouping. Other near and dear relatives except dependent children stay together. The main characteristics of a typical joint family can be the following statements. It consists of a number of married couple and their children who live together in the same household. Generally, two generations stay in the household. All the property is held in common. All the authority is vested in the senior male members of family.

Three generation family: *(DU, 2016)*

This three-generation family possesses representatives of three generation. Grandfather(s), son(s) and grandson(s) are living together by direct descent. This is commonly found in West Bengal, Tripura, etc.

Matrilineal family: *(SSUHSA, 2023)*

Matrilineal refers to familial relationships that can be traced through a female. To follow the matrilineal line in your family, start with your mom. In Latin, matri—refers to the mother, just as patri—refers to the father.

In a matrilineal society, the descent or the family name is through the mother's side, and is known as **'matrilineal descent'**. This affiliates an individual with kin of both sexes, related to him or her through women only. Kapadia (1966) has mentioned that all children of a woman take the family name of their mother.

Matrilineal families are found in the South and in the Northeast. Matrilineal societies in India are typified by **the Khasis of the Jayantia Hills and the Garos** are the best known examples of matrilocal and matrilineal societies in Meghalaya state and the traditional **Nayar in Kerala**.

Minangkabau society is the **biggest matrilineal society** in the world. It is found in the Minangkabau highlands of **West Sumatra, Indonesia**. Daughters inherit family properties and land from their mothers. In traditional Minangkabau families, descent is traced through the mother and her maternal ancestors.

Broken family: *(SAMU, 2016; AKUB,2022; KIMS, 2022)*

This family is derived from a complete family. Here, parents may be separated or one or both parents died.

Problem family: *(GITAMAP, 2023; RGUH*

This may be a complete family with social problem. The family may have personality problem of p relationship problem, poverty, illness, mental emotional instability, character defects, behavior problem, disharmony which influence the rearing of children. This family cannot support the children in prope

Q1a. Different stages of family cycle. *(ABKUB, 2023; GNSUB*

Phase of formation: This phase starts with marriage and ends with the birth of the first child.

Phase of expansion: This starts with the birth of the first child and expands with the birth of the succ children. Thus, it is the stage of growth.

Phase of completion: This ends with the birth of last child.

Phase of contraction: This occurs when female children (daughters) get married and go to husband's h or sons leave the house in search of jobs or separate out eventually and repeat the family cycle. Wit there will be reduction in size of the family. It is also called as stage of reduction.

Phase of dissolution: This starts when one of the parental couple passes away and total extinction o when the survivor also dies. This is also called stage of disintegration.

Often certain variations and exception occurs such as early death of children or one spouse, di childlessness, etc.

Q1b. Role of family in health and disease. *(YSRUHSAP, 2015; MGUB, 2023, 2024; ABKUB VNSGUS,*

No scientific practice towards an individual is complete without the knowledge of his/her family. Compo and structure of family, its cultural and socioeconomic aspect, environmental conditions, etc., all pl important role initiating disease as well as promoting health and nutrition of its members. Family pla important role in both health and disease, in the prevention and treatment of individual illness, in the of children and dependent adults, stabilization of personality of both adults and children and rehabili of family members in case of problems and broken relations in the community.

No family practice can be meaningfully carried out without community background of health and dis problem.

Q2. Write the functions of family. *(WBUHS, 2018; BNMUB, 2012; ABKUB, 2010, 2011; RGUHS, 2013, TRIU, 2016; TDMGRMU, 2008; GOAU, 2022; SSUHSA, 2023; AFUH,*

Ans. Socialization: The family is a bridge between generations and between father and sons. It is the tra point of civilization. The cultural pattern relating to eating, cleanliness, dress, speech, behavior, langu are all transmitted through family. Values of society, culture, belief, code of conduct, etc., are transfer the family. This will protect the child from unsocial and or anti-social immoral activities.

Residence: One of the major social functions of the family is to provide a clean and descent residence members. There are two types of residence—patrilocal and matrilocal. This will provide the child a protec from physical hazards of nature.

Reproduction and bringing up of children: This is a very important function of the family. The mother ta absolute care of the infant and children up to a certain age. The father provides for education and tea the child the social traditions and customs. They arrange for specific protection.

Economic function: The family implies the economic partnership for the family and the progeny inheritance of the property and ownership and/or control of certain kinds of property like the farm s or dwelling are controlled by the family. This will provide the capacity for purchasing food and he commodity.

Care of dependent adults: Care of sick and injured persons, care of women during pregnancy and c birth, care of the aged and handicapped are seen in the family. This care includes medical care, health social care and others so that dependent adults may remain healthy in physique and mind.

Stabilization of adult personality: Adult members of the family may lose the temperament and peace in stress and strain where family acts as a shock absorber and personality will remain stable.

Familial susceptibility to disease: Family transfers a pool of genes to its next generations and in case bad or pathological genes this transfer will cause harm. The same environment will provide harmful or helpful environment which is generally not changed. This may lead to a bad situation of health and on the contrary good situation.

CM2.1: Describe the steps and perform clinico-socio-cultural and demographic assessment of the individual, family and community.

Steps of clinico-socio-cultural and demographic assessment of the individual, family and community: Under the primary healthcare services, through the network of sub-centers, PHCs, CHCs, ASHAs and AWWs are reaching the families. Health worker females, ASHAs and AWWs are maintaining family records in Household Survey Registers, it is also updated once in a year and its information is used for community need assessment (CNA).

The objectives of household survey are:

- To assess community health needs.
- To assess the clinico-social, cultural and demographic profile and health status of each individual in the household as well as environmental status.
- To identify high risk households and families.

Village health register/ward register:

Household surveys are carried out village wise by health team. Village health sanitation and nutrition committee is responsible for preparing of village health action plan based on village health register. Village health register provides information on demography – total population, age wise population structure, total number of households and families. Eligible couples, infants, pregnant and lactating mothers, sources of drinking water and sanitation facilities, health facilities available, village practitioners (quacks), major health problems, health seeking behaviors of the community along with births and death records. In the urban areas ward registers are prepared under the supervision of ANMs and supervisors.

In summary the workers visited priority houses like schedule caste, schedule tribes, below poverty line and landless families and families having either infant and pregnant mothers.

CM2.2: Demonstrate in a simulated environment the correct assessment of socioeconomic status.

Socioeconomic status (SES): Various attempts have been done in past by eminent scholars and medical scientists to plan a group of composite indexes to determine SES of an individual or a family living in urban or rural areas.

The worth mentioning among those scales include, "Rahudkar scale (1960), BP Prasad (1961), Udai Parikh (1964), Jalota (1970), Modified Kuppuswamy (1976), Srivastava (1978), Bhardwaj (2001) and recently OP Aggarwal (2005). The most common indexes taken into account include total income, educational status and occupation. Among various scales for determining SES, the most widely and popularly used scales in India include **"Updated Modified Kuppuswamy SES"** which is mostly used for **urban areas.**

Q2a. **The Kuppuswamy SES has included three parameters (occupation of head of the family, education of head of the family and total family monthly income),** and each parameter is further classified into subgroups and scores have been allotted to each subgroup in **Tables 2.1 to 2.3**. The total score of Kuppuswamy SES ranges from **3 to 29** and it classifies families into five groups **"upper class, upper middle, lower middle, upper lower and lower socioeconomic class" (Table 2.4)**.

The scale has been revised interminable over the past years because the parameter of overall income of the family from all the sources scale loses its pertinence following the devaluation in the worth of Indian rupee while the occupation of the head of family and education of the head of the family remains the same with time.

By multiplying the generated income scale values of the year 2016 with the **conversion factor of 6.16** that will update the Kuppuswamy SES scale for **February 2023**.

Table 2.1: Occupation of the head of the family.

Sl. No.	Occupation of head of the family	Score
1.	Legislators, senior officials and managers	10
2.	Professionals	9
3.	Technicians and associate professionals	8
4.	Clerks	7
5.	Skilled workers and shop and market sales workers	6
6.	Skilled agricultural and fishery workers	5
7.	Crafts and related trade workers	4
8.	Paint and machine operators and assembles	3
9.	Elementary occupation	2
10.	Unemployed	1

Table 2.2: Education of head of the family.

Sl. No.	Education of head of the family	Score
1.	Profession or Honours	7
2.	Graduate	6
3.	Intermediate or Diploma	5
4.	High School Certificate	4
5.	Middle School Certificate	3
6.	Primary School Certificate	2
7.	Illiterate	1

Table 2.3: Total monthly family income (₹).

Sl. No.	Updated monthly family income in 2016	Updated monthly family income in rupees (2021)	Updated monthly family income in rupees (2022)	Updated monthly family income in rupees (Feb' 2023)	Score
1.	≥40430	≥123322	≥185895	≥249044	12
2.	20210–40429	61663–123321	92951–185894	124489–249043	10
3.	15160–20209	46129–61662	69535–92950	93381–124488	8
4.	10110–15159	30831–46128	46475–69534	62273–93380	6
5.	6060–10109	18497–30830	27883–46474	37325–62272	4
6.	2021–6059	6175–18496	9308–27882	12445–37324	3
7.	≤2020	≤6174	≤9307	≤12344	2
					1

Table 2.4: Kuppuswamy's socioeconomic status scale 2022.

Sl. No.	Score	Socioeconomic Class
1.	26–29	Upper (I)
2.	16–25	Upper Middle (II)
3.	11–15	Lower Middle (III)
4.	5–10	Upper Lower (IV)
5.	<5	Lower (V)

Source: Ayoub S, Raja R. Economic parameter of modified Kuppuswamy socioeconomic status scale for the year 2023. Indian J Forensic Community Med. 2023;10(2):99-101.

Modified BG Prasad's scale (Table 2.5): This socioeconomic status scale is used for both **urban and rural areas.** The BG Prasad's scale first appeared in the Journal of the Indian Medical Association in the year 1961 and was based on the **consumer price index (CPI)** of 1960.

Table 2.5: The original classification proposed by BG Prasad in 1961.

Social class	*Per capita monthly income limits (₹)*
Upper (I)	100 and above
Upper Middle (II)	50–99
Middle (III)	30–49
Lower Middle (IV)	15–29
Lower (V)	Below 15

Hence, it is concluded that due to inflation, there are changes in the country's consumer price index over time, so it is very important to regularly update the SES based on income.

Correction factor = current index value (138.4) × linkage factor between 1960 and 1982 (4.63) × linkage factor between 1982 and 2001 (4.63) × linkage factor between 2001 and 2016 (2.88) whole divided by base index in 2016 (100) = 90.98.

The new income values can now be calculated using the formula, new income values = Correction factor × old income value of 1961.

Table 2.6 shows the updated values of per capita monthly income for October 2023.

Table 2.6: Proposed modified BG Prasad's social classification.

Prasad's social classification (1961)		*Revision of the Prasad's classification for the year May 2022*	*Modified Prasad's classification for the year October 2023*
Social class	**Per capita monthly income limits (₹/month)**	**Per capita monthly income limits (₹/month)**	**Per capita monthly income limits (₹/month)**
Upper (I)	100 and above	8,349 and above	9,098 and above
Upper Middle (II)	50–99	4,174–8,348	4,549–9,097
Middle (III)	30–49	2,505–4,173	2,729–4,548
Lower Middle (IV)	15–29	1,252–2,504	1,365–2,728
Lower (V)	Below 15	1,251 and below	Below 1,365

Source: Mahantshetti S, Singh J, Dhandapani S. Updated Modified BG Prasad Classification for October 2023. Natl J Community Med. 2024;15(1):89-90.

CM2.2: Describe the sociocultural factors in health and disease.

Q3. What are the cultural factors in health and disease? *(RGUHS, 2011, 2014; YRSUHSAP, 2015, 2023; SAMU, 2012; TDMGRMU, 2013, 2016; KIMS, 2014, 2023; SSUHSA, 2018; RUJH, 2010; GOAU, 2021; ABKUB, 2023; MGUB, 2024)*

Impact of caste and religion on health *(KIMS, 2023)*

Ans: Each and every individual have their own beliefs and practices concerning health and disease.

A. Concept of disease etiology and its cure: Most of rural people thought that disease is caused by supernatural powers.

- *Supernatural causes:*
  - Worth of God and Goddess: Many people even educated believe that certain disease is caused by worth of some God and Goddess. Examples: Smallpox and chickenpox caused by Sitala Devi and Chhoti Mata respectively. Hence cases are not notified and for its cure pujas are made to appease the god.

- Breach of taboo: Breach of taboo is believed by some person responsible for certain dis... Examples are venereal diseases caused by illicit sexual intercourse with a woman of low caste women during menstruation.
- Past sins: Diseases like leprosy and tuberculosis is caused by past sins
- Evil eye:
  - ◊ Children are most susceptible to the effect of evil eyes.
  - ◊ To protect the child charms and amulets are prescribed.

B. Physical causes:

- *Weather:*
  - Exposure to heat during summer is responsible for an attack of heatstroke.
  - The folk remedies consist of application of oil and ghee on the sole of feet and administrat... mangophool (prepared by keeping unripe mangoes under hot ashes for a few minutes and extra... the pulp in cold water) with a pinch of salt.
- *Impure blood:*
  - Skin disease: Boils and scabies
  - Remedy: Eating neem leaves and flowers is consider to purify blood

C. Environmental sanitation:

- *Disposal of human excreta:*
  - Majority of rural people is habituated with open air defecation
  - They do not know that fecal matters are infectious and it pollutes water and soil and promote... breeding
- *Disposal of wastes:*
  - Most of the villagers are not aware that mosquitoes breed in collection of waste water.
  - The solid waste (refuse) and cow dung are thrown in front of house and is permitted to decomp... without maintaining hygiene.
- *Water supply:*
  - In majority cases, wells are being used by villagers for bathing, washing clothes and bathing animals. These cultural practices lead to pollution of water.
  - Cholera and gastroenteritis are caused due to use of these water.
- *Housing:*
  - The rural houses are kuccha, damp, ill ventilated and without kitchen and sometimes the domes... animals live under the same roof.
  - These cultures help in causing respiratory tract infections.

D. Food habits and other habits:

- Foods such as meat, fish, eggs, jaggary generate heat; foods such as curd, milk, lemon are consider... to cool for body.
- Muslims avoid pork, hindus beaf.
- Muslims observe fast during ramjan, hindus during pujas which causing change in food habi... sometimes it is harmful for human health.
- Adulteration of milk is common practice.
- Ganja, bhang and charas are frequently used by Sandhus.
- Smoking hukka a social customs, may cause tuberculosis.
- Burning end of cigar inside the mouth may cause oral cancer.
- Eating pan leaves smeared with lime with or without tobacco is a common social customs.
- In villages people use neem stem as brush and in urban areas replaced by tooth brushes.
- Many people sleep in ground due to poverty and exposed to insect and snake bites.
- The transmission of hook worm associated with bare foot.

E. Mother and child:

- Prolonged breastfeeding, oil bath, massage and controlled exposure to sun are good habits.

- **Bad habit:** Some foods are not given to pregnant mothers like eggs, meat, fish, and milk and even after delivery, foods are being restricted for lactating mothers.
- Punching the ear and nose, application of oil and other materials in anterior fontanel.
- Applying of 'Kajal' mixed with oil to the head and eye lids for beautification and partly from warding off the effects of evil eye.
- Bathing naked is a taboo.
- After child birth there may be many emotional baths.
- Practice of oil bath is a good Indian customs.
- The traditional barber does not sterilize instruments after use and no idea about microorganisms as well.

F. Sex and marriage:

- Orthodox Jews are forbidden to have intercourse for 7 days after the menstruation ceases.
- Certain religious groups avoid pray or intercourse during menstruation.
- Social custom of early marriage and consanguineous marriage.

Miscellaneous:

- Purdah is mostly used by Muslims, may cause skin diseases.
- Circumcision is religious customs for Muslims and Jews.

CM2.4: Describe social psychology, community behavior and community relationship and their impact on health and disease.

Social psychology: Social psychology studies the behavior of individual and group. It provides understanding of processes involved in thinking, perception, motivation, learning, attitudes and options among individuals and groups.

Community behavior and their impact on health and disease:

Health promotion and prevention typically requires behavior change that starts in household and gain support through the community. **Example:** Complementary feeding are better infant and child feeding practices by mother or caregivers, such practices must be learned by an individual at home and reinforced by community. Children must learn to wash their hands and other good practices, that are cultivated in home, in school and among neighbors and friends. When infant and children or any person become sick, specially family members like parents and other caregivers provide 1st line of care. Household members particularly parents, undertake the primary diagnosis of illness, assess the severity and probable outcomes, select treatment and care options—including home treatment for diarrhea, cough and fast breathing and used to procure drugs and other remedies.

Community behavior and practices:

Promotion of best practices:

- Breastfeeding specially exclusive breastfeeding
- Acceptance of immunization
- Spacing of births at least 3 years
- Limiting family size
- Healthy lifestyles

Harmful practices:

- Use of tobacco, alcohol
- Physical inactivity
- Junk foods
- Excess intake of saturated fat, sugar and salt

Community relationship:

The way in which providers of health services are connected with community known as community relationship.

Poor quality of relationship with the communities leads to client dissatisfaction and poor use of public health services.

Connecting caregiving between households, communities and health facilities as well as primary and referral care is a dynamic process for continuum of services.

Linkage of households and communities to health systems ensure continuity of services and enhances access and quality of services.

Good relations with communities promote access and quality services. Quality of health care depends not only the contacts, relationship of trust and confidence are important for sustain changes in health behaviors. Community relationships → contacts/linkages between clients (community) and health providers.

Examples: National rural health mission introduced key component of ASHAs as community health worker program to increase household access to health services. Over 10 lakh ASHAs are there at community level. ASHAs are part of community and resident of same village/ward in urban set-up. One ASHA for 1,000 population in rural and 2,500 in urban area forms a bridge/link between community and formal health system.

Impact on health and disease:

Launching a program of health education or BCC strategies and their implementation requires through understanding of community and its "way of life". The knowledge of social sciences is also essential in the areas of:

- Organization of health services
- Strategies of effective communication with patient/client/community on health matters
- Policy for allowing visits of relatives and near ones in hospitals
- To develop good interpersonal relationships between health team and community members
- Community need assessment
- To enhance community participation
- To enhance the compliance of treatment and follow up of instructions
- To develop user-friendly health services
- To enhance utilization of services
- To enhance patient or client satisfaction

CM2.3: Describe and demonstrate in a simulated environment, the assessment of barriers to good health and health seeking behavior.

Barriers to good health and health seeking behavior:

The households and communities are places where health and health-seeking behaviors/practices are learned and supported. Common barriers in health and health-seeking behaviors in the community are

- **Poverty:** People may not be able to afford health services cost.
- **Illiteracy:** Lack of information and knowledge of services and unable to recognize when sick person needs service outside home. Lack of health literacy is widely prevalent in India to the extent of 90%. Universal health literacy is a must to achieve universal health coverage.
- **Cultural barriers:** Poor acceptability due to wrong belief, attitudes and practices.
- **Access to healthcare services:** Poor access, distance, lack of transport, roads and inaccessible health services.
- **Poor quality of health services in public facilities**
- **Timing not suitable**
- **Gender biases**
- **Lack of community participation**
- **Lack of confidentiality**
- **Lack of faith and trust in the system**

Health seeking behavior: Higher inclination towards allopathy treatment was prevalent in both rural and urban sectors for over 95% of treatment ailments was sought from allopathy providers, 4.8% sought from AYUSH and remaining 0.2% from other sources. Over 68% in rural and 74% in the urban areas the spells of ailments were treated in private sector. Only 32% rural and 26% urban spells of ailments were treated at

government facilities (sub-center, PHC, CHC). Thus, private sector was most important single source of treatment in urban and some of the rural areas. Preventive services over 90% of people used government health services, since these are not profitable in private sector.

How to overcome these barriers?

- By education—universal health literacy
- User-friendly health services
- Healthy public policies
- Community participation

CM2.5: Describe poverty and social security measures and its relationship to health and disease.

Poverty: It is a situation in which a person is unable to get minimum basic necessities, i.e., food, clothing and shelter for his/her sustenance or inability to attain a minimum standard of living.

Q4. What is poverty line? *(RGUHS, 2012; TDMGRMU, 2011; DU, 2014; GOAU, 2022)*

Ans: **Poverty estimates in our country are derived from household consumer expenditure data collected by National Sample Survey Organization (NSSO) every 5th year.**

Poverty line is defined as **the expenditure required for a daily calorie intake of 2,400 per person in rural areas and 2100 in urban area [Expert group, 2012 (Rangarajan)]** Expert group, led by Rangarajan submitted its report in 2014 giving 'per capita monthly expenditure' as ₹ 972 in rural areas and ₹ 1,407 in urban areas as poverty line. It preferred to use 'monthly expenditure of household of five' for the poverty line purpose which came out to be ₹ 4,860 in rural areas and ₹ 7,035 in urban areas.

Problem of people living below poverty line: Their acceptance of health services such as immunization, family welfare, sanitation and health seeking behavior, etc., will be poor leading to increased mortality and morbidity. Such families also develop depression, suicidal tendency, etc.

Significance: Population living below poverty line is an indicator of economic development of a country. 22% of population lives below poverty line (2013).

Q5. Define social security. Social security scheme for industrial workers.
(WBUHS, 2009, 2014, 2021; GNSUB, 2022; PBDSUHSH, 2017; RGUHS, 2014; KIMS, 2021; SAMU, 2011; ABKUB, 2009; TRIU, 2013; SSUHSA, 2010; NU, 2014; MU, 2019)

Social security is a basic human right *(WBUHS, 2023)*

Ans: **Social security** is the security or the guarantee that the society furnishes through appropriate organization to its member during the time of crisis such as loss of working or earning capacity, due to sickness, invalidity, maternity, old age and death. It is essential, because those who are not secured in this way may cause social harm for fulfilling their own needs. Thus, social security is the basis of social welfare.

Social security scheme for industrial workers *(WBUHS, 2021)*

Social security includes social insurance and social assistance.

Social insurance: It is a system of income security, where there is contribution not only by the employees but also employers and the organization. **Examples**: ESI, CGHS have been taken as social insurance matter.

Social assistance: Here, there is no contribution system. It entitles persons like unemployed, disabled, old, widows, orphans, handicapped, etc. **Examples**: Indira Gandhi Old Age Pension Scheme.

SHORT NOTES AND RELEVANT QUESTIONS

Q6. Family is considered as an epidemiological unit—explain why? *(WBUHS, 2014; ABKUB, 2023)*

Ans: **Definition of epidemiology**: It is the study of the distribution and determinants of health related states and events in a specified population and application of this study to the control of health problems. One aspect of epidemiology is to deal with distribution of person.

Family is group of people living together who are related biologically or by marriage or by adoption sharing a common kitchen. Community implies a group of people with common characteristics or interests living together in a larger society. A community have its own customs, traditions, leaders or even language. Example of community includes a village, tribe, an urban slum, and a religious group, etc.

Community medicine is the specialty which deals with populations and comprises those doctors who to measure the need of the population, both well and seek, who plan and administer services to meet these needs, those who are engaged in research and teaching in the field.

We treat **community as ward, family as bed and individuals as beneficiaries.**

In a family different type of members are present, so diseases and disabilities are found in a family young children having problem of malnutrition, anemia, etc., while in old age problem of hypertension diabetes mellitus, cataract and joint problem, etc.

In a community, different types of families are present. So distribution of different type of problems a same family or different family in a community are present. **Thus, the principle of epidemiology** start **from family level.**

Q7. Family as a unit of health. *(WBUHS, 2019; MGUB, 2022; AKUB, 202*

Ans: No scientific practice towards an individual is complete without the knowledge of his/her family. Composition and structure of family, its cultural and socioeconomic aspect, environmental conditions, etc., all play important role initiating disease as well as promoting health and nutrition of its members. Family plays important role in both health and disease, in the prevention and treatment of individual illness, in the care children and dependent adults, stabilization of personality of both adults and children and rehabilitation family members in case of problems and broken relations in the community.

No family practice can be meaningfully carried out without community background of health and disease problem.

Q8. Describe social groups/crowd and mob are different *(WBUHS, 202*

Ans: Social groups are divided into temporary and permanent.

Temporary social groups			*Permanent social groups*
Crowd	***Mob***	***Herd***	***Band***
When a group of people come together Temporarily for a short period of time, motivated by a common interest or curiosity. It is lack of internal organization and leadership	The mob is also a crowd but has a leader who forces the members into action. It is initiated with a symbol in the form of flag or slogan. It is more emotional than crowd. When the purpose of the mob is achieved, the group disperses	It is also a crowd with a leader, members of the group have to follow the orders of the leader without question	It the most elementary community of a few families living together it has organized itself and follows a pattern of life
Example: Witness a football match by a group of people	**Example:** Agitation by a group of people before an appropriate authority for fulfilling a common issue	**Example:** Tourist group under a guide	**Example:** Gypsies in India

Q9. Internship is an example of socialization *(WBUHS, 2024*

Ans: Internship is an example of socialization for intern doctors. It helps them to learn how to become acceptable to the community at large. It helps in development of necessary qualities to function effectively as a doctor in the society. This program is their opportunity to learn verbal and nonverbal communication skill, how to behave with the patients and maintain ethical principles as laid down through AETCOM modules.

Q10. Describe social diagnosis. *(SSUHSA, 201*

Ans: Medical diagnosis: This is the diagnosis of the medical condition in the index case, e.g., Type 2 diabetes mellitus.

From this medical diagnosis idea of social diagnosis has come after generation of social medicine.

Social diagnosis: This is an enumeration of adverse social factors in the family. These may have, directly or indirectly, influenced the precipitation of the disease or its appropriate management and rehabilitation. For example, low socioeconomic level, illiteracy, no regular follow-ups, alcoholism, not using any contraception. etc., are few bio-social factors which influence health and other health-related issues. Other issues like overcrowding, illiteracy in any family member, children not fully immunized, not studying in age appropriate class, school dropout, poor ventilation, and not using iodized salt also play their role in health.

Social, cultural, psychological and behavioral factors are important variables in the etiology, prevalence and distribution of disease. The way the people live, their habits, beliefs, values and customs are significant determinants of individual and collective health. They form some of the few issues of social diagnosis.

In the past two decades, research on the sociology of diagnosis has attained considerable influence within medical sociology. Social diagnosis helps us recognize the interplay between larger social structures and individual or community illness manifestations. This approach is useful not just for sociological research, but has direct implications for the fields of medicine and public health. Approaching diagnosis from this integrated perspective potentially provides a broader context for practitioners and researchers to understand extra-medical factors, which in turn has consequences for patient care and health outcomes.

Q11. Describe social pathology. *(SSUHSA, 2009, 2012; BUMP, 2012; YSRUHSAP, 2019)*

Ans: It deals with study of the defect in the society.
It can be divided into various domains.

a. Social constrains
b. Social evil
c. Social deviance

Social constrains: This means restrictions which prevent the prosperity and progress of the people of the community.

Examples: Poverty, illiteracy, ignorance, migration, industrialization, urbanization.

Social evil: This means undesirable practices result in multiple social problems. **Examples:** Tobacco smoking, drinking alcohol, child neglect, child abuse, child labor and abandonment, prostitution.

Social deviance: This means antisocial behavior occurring among those who have failed to conform to acceptable social norms and adopt a way of life which is against the interest of society. **Examples:** Drug abuse, juvenile delinquency, suicide, etc.

Q12. What is social stress? *(WBUHS, 2017)*

Ans: A major source of stress is conflict generated by new opportunities and frustrations arising from social changes.
These stress condition includes:

a. Migration from rural to urban areas.
b. Consequent diminution in the traditional family support system.
c. Greater exposure through mass media to ideas that had been previously culturally alien.
d. Tourism.
e. Changes in the technological needs of society requiring skills that are different from those of previous generation.
f. Training or education currently available is inadequate.

The pressure is mostly felt where young people have little control over their own destinies. Rapid population growth further increases greater competition in the younger age groups and resources are inadequate to meet their needs.

Causation of physical and psychological disorders is multifactorial. The experience of stress, particularly in the absence of a social support system or when there is a discrepancy between the actual and perceived demands of a stressful situation, may contribute to further disorders. Psychological stress and inadequate

coping ability has been implicated as a contributory factor in virtually all diseases. There are direct link between stress and hypertension and coronary heart disease.

Q13. Customs do not always have deleterious/negative effect on health—discuss the statement. *(WBUHS, 2016, 2019, 2*

Ans: Customs are technically divided into **"folkways" and "mores".** The folkways are right way of doing thi where it is regarded as the less vital areas of human conduct.

How do you greet someone when you first meet him? Often, greetings include some form of words like 'Hello' and or 'How are you?' Perhaps you shake the person's hand and smile when you introduce yourse You probably expect similar behaviors from the other person. You can be confident that the person you a meeting will reciprocate in a similar manner because these behaviors are folkways.

Folkways are the customs or conventions of daily life. They are various types of social norm; what we do our expectations about how others react. In sociology, folkways are generally discussed in contrast to mores because they both are types of social norms, though they vary in the degree to which they are enforce Folkways are mildly enforced social expectations, while mores are strictly held beliefs about behaviors. Mor dictate right and wrong, while folkways distinguish between proper and rude behavior.

Mores: Cultural mores, like norms, are unwritten social expectations that are deeply *ingrained* into a cultur They differ from norms, however, because violations of mores are viewed as serious infractions that resul punishments or social consequences. Mores are like a more formalized version of norms.

Mores are often dictated by a society's values, ethics, and sometimes religious *influences*. Some ide mores can be conceptualized from the examples included here. It is not considered acceptable or mainstrea to abuse drugs which are socially stigmatized. Particularly *heroine* and *cocaine are considered in that wa*

Mores are social rules that are more strictly enforced than folkways, but less strictly enforced than law or taboos. Good *table manners may be considered other issue of mores*. You will never get arrested for showin horrible *table manners*, but you might lose some friends.

Q14. Describe culture. *(NU, 201*

Ans: Culture is defined as **"Learned behavior which has been socially acquired."** Culture is the product of huma societies and man is largely a product of his cultural environment. Culture is transmitted from one generatio to another through learning processes, formal and informal. Culture stands for the customs, beliefs, law religion and moral precepts, arts and other capabilities and skill acquired by man as a member of the socie

Every culture has its own customs, some of which have a profound influence on the incidence of disease For example, in developed countries lung cancer from smoking and cirrhosis of liver from drinking are th result of the abuse of widely proclaimed social habits. In India, chewing pan is associated with oral cancer It is now widely established fact that cultural factors are involved in matter of personal hygiene, immunizatio nutrition, early medical care, family planning, disposal of waste material, excreta disposal—in short, th whole way of life.

Culture moulds the behavior of people in the society. Good behavior may promote health and on th contrary poor behavior may cause harm in respect of health and other health related states. We should identify the positive side and issues of culture and that should be promoted.

Q15. Describe role of emotions in health and disease. *(ABKUB, 201*

Ans: Emotional states determine human behavior. Anger can cause a person to be rude and sarcastic. Disorder o emotion interfere with human efficiency—lack of concentration, lack of appetite, increased risk of accidents lack of sleep, palpitation, etc. Emotional disorder in children may appear in the form of temper tantrums abdominal pain, spasms, tics and antisocial behavior such as aggressiveness.

Psychological illness: There are a group of diseases known as psychological diseases (mind acting o body), e.g., essential hypertension, peptic ulcer, asthma, ulcerative colitis which are attributed to disturbed emotional states.

Control of emotions: A well adjusted and mentally healthy person is one who is able to keep his emotions under control. Children should be shown love and appreciation so that they may grow into emotional maturity. For adults, a happy family life is basic for emotional adjustment. Patients who are anxious need reassurance and their fears must be allayed.

The following tips may be useful in controlling one's emotions:

- Cultivate hobbies, good habits of reading and recreation
- Adopt a philosophy of life to enable you to avoid mental conflicts
- Try to understand your own limitations
- Develop a sense of humor

A study of psychology helps us to understand the basis of emotions and the need to keep emotions under control.

Q16. What is acculturation, its merits and demerits? *(WBUHS, 2022; ABKUB, 2006; GITAMAP, 2023; YSRUHSAP, 2021; RGUHS, 2012; SAMU, 2012, 2015; TDMGRMU, 2012, 2013; VBUJH,2023; VNSGUS, 2023)*

Ans: Acculturation means **"culture contact".** When there is contact between two persons or two groups of persons with different types of culture, there is exchange (diffusion) of culture in many ways. The culture contact takes place through migration, urbanization, industrialization and social mobility (commerce, education, trade and information technology, etc.)

Indian migrants acquire the culture of western countries and change their lifestyles like dietary practices, smoking and alcohol consumption or Western people may adopt Indian culture and may become vegetarian and adopt Indian diet and Yoga or meditation.

The knowledge of social sciences is essential to assess the community health needs and community diagnosis. Acceptance of family planning program necessitates through understanding of reproductive behavior of people, their knowledge, beliefs, attitudes and practices in relation to reproduction.

Many orthodox Brahmins in India eat meat today, thus change of food habit due to cultural contact only. Media like radio, TV and cinema play an important role in acculturation.

Merits: Acculturation in education allows for cultural interchange and exchange, without requiring that cultures or ethnic backgrounds be erased or changed in favor of a mainstream, common culture. In acculturation, both cultures in contact with each other are changed but remain essentially the same. At the group level, acculturation often results in changes to culture, customs, religious practices, diet, health care, and other social institutions..

Demerits: Immigrants' acculturation creates a conflict between their old and new cultural values, and consequently, results in the loss of their family social and moral support that is very important in shaping a definite ethnic identity.

Q17. Explain about medical social worker (MSW). *(BNMUB, 2014; RGUHS, 2013; TDMGRMU, 2011, 2012; ABKUB, 2005; MGUB, 2023; KIMS, 2023)*

Ans: Medical social worker (MSW) is a paramedical person (he/she), qualified in sociology with training in health education and is attached to health institution, doing both medical and social work. He/she acts as a link between the health institution (physician) and community (patient) and between the patient and social welfare agencies. Such positions of MSW are available in general hospitals, industries, mental hospitals, leprosy clinics, STI clinics, TB clinics, department of community medicine and its attached urban and rural centers.

Responsibilities: He/she assists the doctor and is of help the patient, family and community at large.

To the doctor: MSW provides information to the doctor about the patient's social background about living condition, socioeconomic status, nature of work, type of family, habits, etc., which has an influence on the development of the disease. This will help doctor to make social diagnosis and subsequent treatment.

To the patient: MSW gives information about the causation of disease, mode of transmission, measures and treatment. He/she removes doubts about misconceptions about disease and treatment. She works like that of a nurse in the medical ward.

To the family: MSW educates the family about nursing the patient, showing sympathy, extending cooperation towards the patient, etc., which is help in speedy recovery. He/she provides emotional support for management.

To the community: MSW gives health education to the public at large by organizing films shows, presentations, etc., also motivate couple for family planning.

Miscellaneous: MSW takes active participation in organizing mass health camps, cataract camps, camps and immunization, etc., participates in teaching and training activities in department of community medicine, and arranges financial assistance for patients from different social welfare agencies.

Q18. What is social mobilization? *(WBUHS 2*

Ans: Society moves along rules and regulations framed by the society. Sometimes people do not move part for their betterment due to lack of understanding. If they move forward for some activity, that work finished very smoothly in little efforts. Social mobilization is the cornerstone of participatory approach rural development and poverty alleviation program. It is a powerful instrument in decentralization p and program. Social mobilization strengthens participation of rural poor in local decision-making, imp their access to social and production services and efficiency in the use of locally available financial resou and enhances opportunities for asset-building by the poorest of the poor.

Many types of neighborhood groups, health and literacy programmes, *Mahila Mandals* (village wom groups) and the mass media—newspapers, radio and TV—also play a vital role in social mobilization at community level. For successful social mobilization of the rural poor, there is a need for improved acce public information on local development issues directly linked with their livelihood interests. An effect way of doing this is by facilitating free access to public information on local development programs activities, which has been a critical factor in the success of *Panchayati Raj* in different states.

Examples of successful social mobilization: Total sanitation program in Avanur Gram Panchayat, Kera India.

This total sanitation program has also been implemented in different parts of West Bengal.

Q19. What is social defense? *(ABKUB, 2009; SSUHSA, 2*

Ans: The term **"social defense"** is used to describe nonmilitary action by a society or social group, particularly in a context of a sustained campaign against outside attack or dictatorial rule—or preparations for such campaign in the event of external attack or usurpation.

Social defense as understood in common parlance pertains to certain marginalized population group requiring protection as well as care and support through systematically organized and coherent efforts both by government and civil society. Newer social defense issues such as drug abuse, old age, beggary, HIV AIDS, trafficking, probation services, prisons, transgender, etc., are the emerging concerns. Therefore, the efforts for well-being of these marginalized section of the society is vital and requires immediate and suitable interventions.

The following training and capacity building programs are conducted:

- A comprehensive 1 month Certificate Course on Social Defence Issues is organized for the Government, NGO and Panchayat functionaries.
- Three-day Training Program for Government/NGO/Panchayat functionaries on Social Defence Issues
- Three-day Training Program for the functionaries of Police Department on Social Defence Issues
- Three-day Regional Level Training Programs on Social Defence Issues for Social Work Professionals
- Three-day Program on Specialized Care for Children Affected by Drug abuse for Concerned Government NGO Functionaries.

- Five-day Training Program on Counseling Skills for stakeholders in field of social defence.
- Three-day State Level Training Program on Beggary Prevention for Government/NGO functionaries.
- National level seminars and workshops are organized.
- Sub-group and expert meetings on beggary and transgender are conducted.

Q20. What are social therapeutics measures? *(SSUHSA, 2007)*

Ans: **Social therapeutics** is a **social** and cultural approach to human learning and development at use in psychology, education, health care, organizational development, youth work, community organizing, and theater and creative arts approaches to **social** change.

Social therapy is an activity—theoretic practice developed outside of academia at the East Side Institute for Group and Short Term Psychotherapy in New York. Its primary methodologists are cofounders of the East Side Institute, Fred Newman and Lois Holzman. In evolution since the late 1970s, the social therapeutic approach to human development and learning is informed by a variety of intellectual traditions especially the works of Karl Marx, Lev Vygotsky and Ludwig Wittgenstein.

Recently, however, the idea of social therapy is being challenged by an organization called Project Toe. Co-founder Mike Bardi challenges the assumption that social therapy is strictly group therapy. He argues that social therapy is more about, "empowering people to help one another." Group therapy is a form of social therapy, but with the evolution of technology, social therapy is evolving into other forms. These forms include internet, online therapy, nonprofessional therapy, and many other forms that redefine the therapeutic process. Alternatively, the term "social therapy, as used in the Camphill Movement at Camphill communities, is used to label a professional discipline inspired by Rudolf Steiner, a philosopher, teacher and the founder of anthroposophy, and put into practice by Karl König. A healthy social environment is essential for adults with developmental disabilities to live productive, independent, and joyful lives. The training in social therapy provides practical, emotional, psychological and spiritual tools and insights necessary for living and working with developmentally disabled adults.

Q21. What is social control mechanism? *(BNMUB, 2008; YSRUHSAP, 2013; RGUHS, 2014)*

Ans: In every society, there are rules, formal and informal for the maintenance of relationship of authority and subordination. The laws and enactments of Parliament are social control mechanisms. In the field of health, there are various acts, some central and other state or local which help to maintain the standards of health. Even in small organization, there are sets of formal rules and regulations which control the behavior of individuals to perform different roles. Besides formal rules, sometimes informal social pressures are brought to bear upon individuals to help construct norms of behavior. The informal social pressure may be extended to powerful groups, individuals or friends. These mechanisms work largely through reward and punishment. Example: GOI is offering a small financial reward to those who undergo sterilization operation. It is a sort of informal social pressure to further the program of family planning in India. The social control mechanism varies from group to group. A study of these mechanisms may be helpful to the community health worker in carrying out the health programs.

Q22. Social medicine and socialized medicine are not same. *(AKUB, 2022)*

Ans: Construct the answer from the questions below.

Q23. Describe socialized medicine. *(ABKUB, 2005; TDMGRMU, 2014)*

Ans: Socialized medicine is provision of medical services and professional education by state but the program is operated and regulated by professional groups rather than by government.

- It is different from social medicine.
- It is the policy of providing complete medical care, preventive and curative to all members of a society usually a whole nation as governmental commitment but out of public finance.
- Russia was the first country to socialize medicine completely.

Advantages: It ensures social equity that is universally operated by the professional health services. Too community participation, it alone cannot ensure increased utilization of health services.

Q24. What do you understand by the term social medicine? *(BNMUB, 2013; ABKUB*

Ans: The **social medicine** has a definition.

This is **"the study of man as a social being in his total environment"**. The total environment in physical, biological and social environment. Broadly it can be said that social medicine has been ad preventive medicine. **In 1848, a French physician Jules Guerin used the word for the first time** 1911, this term was not so popular. Alfred Grotian of Berlin stressed in 1911 that social factors play important roles in health and disease.

Social medicine has been conceptualized taking the idea of social anatomy, social physiology, pathology and social therapy. Social factors take part in health and disease and study of these factors help in controlling health conditions.

Social factors in the light of social anatomy:
Population, age and sex distribution, socioeconomic status, occupation, education of head of the fa housing, industries, schools, knowledge, practice of the population, etc., are few of social factors which their role in health and disease.

Social factors in the light of social physiology: *(RUJH, 2*
Ventilation in house, nutrition and health, disposal of refuse, sewage, excreta, dead bodies, family wel services, demography and population dynamics, customs, habits, traditions, belief, cultural practices a few of social factors compared to human physiology.

Social factors in the light of social pathology: *(AKUB, 20*
Lockouts, thefts, murder, sexual assaults, juvenile delinquency, morbidity and mortality surveys are few the social factors compared to social pathology.

Social factors in the light of social therapy:
Social measures like health education to the community, vaccination campaign, poverty alleviation, roa safety education, etc., should be taken in presence of these situations. Political actions like legal hel measures for general people, safety measures in industry, proper implementation of MTP Act, PEA Act, P Act should be very important in maintaining health of the broader community.

Q25. Crude literacy rate and effective literacy rate are not synonymous. *(AKUB, 20*

Ans:

$$\textbf{Crude literacy rate} = \frac{\text{No. of literate persons}}{\text{Total population in a given area}} \times 100$$

$$\textbf{Effective literacy rate} = \frac{\text{No. of literate persons aged 7 years and above}}{\text{Population aged 7 years and above in a given area}} \times 100$$

The national percentage of literates in the population above 7 years of age is 74.04% with male abou 82.14% and female about 65.46%.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **All of the followings are components of behavioral sciences, *except:*** *(ABKUB, 201*
   a. Anthropology b. Sociology c. Psychology d. Political science
2. **The science of behavior of the individual in society is:** *(YSRUHSAP, 202*
   a. Medical sociology b. Social psychology c. Behavioral science d. Cultural anthropolog

3. An organized group of people with social relationship: *(AFUH, 2022)*
a. Community b. Association c. Society d. Family

4. Extension phage of a nuclear family begins with: *(ABKUB, 2016)*
a. Marriage b. Birth of first child c. Birth of second child d. Marriage of the first child

5. Acculturation is: *(ABKUB, 2017)*
a. A process by which individual gradually acquires culture
b. An exchange of ideas between people
c. A cultural contact
d. Concealing the quality of food and addition toxicants

6. Modified Kuppuswami scale includes all criteria for socioeconomic status, *except*: *(ABKUB, 2018)*
a. Income per capita b. Education of head of the family
c. Occupation of the head d. Total family monthly income

7. Modified Kuppuswamy scale includes all criteria socioeconomic status, *except*: *(AFUH, 2022)*
a. Education level of head of family b. Total family monthly income
c. Occupation of head of the family d. Total income of head of the family

8. Which is correct under Dowry Prohibition (Amendment) Act, 1986? The minimum punishment is: *(SAMU, 2016)*
a. 3-year imprisonment and fine of ₹10,000 b. 3-year imprisonment and fine of ₹15,000
c. 3-year imprisonment and fine of ₹17,000 d. 3-year imprisonment and fine of ₹20,000

9. Which of the following is an example of permanent social group? *(YSRUHSAP, 2023; WBUHS, 2024)*
a. Band b. Croud c. Mob d. Herd

10. _____ is sometimes the individual blames others for this mistake. *(GITAMAP, 2023)*
a. Projection b. Compensation c. Escape mechanism d. Regression

11. Which of the following is a learned behavior which has acquired socially? *(GITAMAP, 2023; MGUB, 2024)*
a. Acculturation b. Customs c. Culture d. Beliefs

12. In which of the following, people resort to childhood practices as a mode of adjustment: *(GITAMAP, 2023)*
a. Projection b. Displacement c. Compensation d. Regression

13. What is social pathology? *(WBUHS, 2023)*
a. Change in disease pattern due to change in lifestyle
b. Study of social problems which cause disease in population
c. Conflicts arising from new opportunities in transitional societies
d. Study of human relationship and behavior

14. Kuppuswamy scale is based on the following variables, *except*: *(MGUB, 2023, 2024)*
a. Education b. Housing c. Occupation d. Income

15. Term "social medicine" was introduced by: *(GNSUB, 2023)*
a. Crew b. John Ryle c. Jules Guerin d. Alfred Grotjahn

16. Acculturation means: *(GNSUB, 2023)*
a. Culture contact b. Study of the various cultures
c. Cultural history of health and disease d. None of the above

17. Learned behavior which is permanent and consistent but liable to change is: *(AFUH, 2023)*
a. Cultural belief b. Knowledge c. Attitude d. Practice

18. The systemic study of causes of human disease in relation to social conditions and disease outside the human body is known as: *(MGUB, 2*

a. Social support b. Social pathology c. Social diagnosis d. Social therapy

Answers:

1.	d	**2.**	c	**3.**	c	**4.**	b	**5.**	b	**6.**	a	**7.**	d	**8.**	b	**9.**	a	**10.**	
11.	c	**12.**	d	**13.**	b	**14.**	b	**15.**	c	**16.**	a	**17.**	d	**18.**	b				

FILL IN THE BLANKS WITH APPROPRIATE WORD(S)

1. Culture contact is known as _____ *(BNMUB, 2*
2. The art of winning friends and influencing people is called _____ *(SAMU, 2*
3. When the new idea or acquired behavior becomes part of his/her own existing values then it is called _____ *(SAMU, 2*

Answers:

1. Acculturation
2. Motivation
3. Attitude

CHAPTER

3

Environmental Health Problems

CM3.2: Describe concepts of safe and wholesome water, sanitary sources of water.

Q1. The meaning of safe water and wholesome water. *(WBUHS, 2020, 2021, 2023; TRIU, 2022; VKSUAB, 2020; MUHS, 2019; AKUB, 2024)*

Ans: **If the following criteria are fulfilled in a sample of water, then that water can be called safe and wholesome water.**

a. Free from pathogenic agents
b. Free from harmful chemical substances
c. Pleasant to the taste, i.e., free from color and odor
d. Usable for domestic purpose for a long time

Sanitary sources of water: Drinking water comes from various sources such as ground water (wells and springs), surface water (lakes, ponds, rivers, etc.) and rain water.

Ground water: It is available in different layers of earth. Rain water percolating into ground constitutes ground water. Water used by humans comes mainly from land. It is now realized that there is a limit to ground water in the world. We should withdraw only quantities of water that can be renewed. The usual ground water sources are wells and springs.

Advantages of ground water:

- It is likely to be free from pathogenic agents.
- It is not required any treatment usually.
- Supply is likely to be available in dry season.
- It is less subject to contamination than surface water.

Disadvantages of ground water:

- It is high in mineral content, salt of calcium and magnesium.
- It requires pumping to lift the water.

Wells are of two kinds, shallow, and deep.

Shallow well: It is rap subsoil water, i.e., the water from above the first impervious layer in the ground. They yield limited quantities of water and the water is notoriously liable to pollution unless care is taken in well construction.

Deep well: It taps water from water bearing stratum below the first impervious layer in the ground. Deep wells are usually machine-dug and may be several hundred meters deep. It furnish the safest water are often most satisfactory sources.

Sanitary well: It is properly located, well-constructed and protected against contamination.

Location: For avoiding bacterial contamination, the well should be located not less than 15 meter (50 ft) from likely sources of contamination. It is recommended that the well should be located such area, no user will have to carry water for more than 100 meter.

Lining: The lining of well should be built of bricks or stones set in cement up to a depth of at least 6 meter (20 feet), so that water enters from bottom and not from the sides of the well. The lining should be carried 60–90 cm (2–3 feet).

Parapet wall: There should be a parapet wall up to a height of at least 70–75 cm (28 inches) above the

Platform: There should be a cement-concrete platform round the well extending at least 1 meter in all directions.

Drain: There should be a pucca drain to carry off spilled water to a public drain or a soakage pit.

Covering: The top of the well should be closed by a cement concrete cover because the bulk of the p should not enter into the well.

Hand-pump: Equipped with a hand pump for lifting the water in a sanitary manner.

User responsibility: Strict cleanliness should be enforced in the vicinity of the well, personal a washing of clothes and animals and dumping of refuse and wastes should be prohibited. Ropes and from individuals should not be used to draw water from the well.

Water from the well should be carried in clean sanitary vessels to the individual houses.

Tube well:

It is a successful source of drinking water in many parts of India. Tube well water is bacteriologically cheaper in comparison to other sources of water. It consists of a pipe sunk into the water bearing and fitted with a strainer at the bottom, hand pump at the top. A water tight concrete platform with to clear the used water. The area within 15 meter of the tube should be kept free from pollution wi and solid wastes. On an average well may last for a period of 5 to 10 years. Chandigarh of Punjab water mostly from tube well.

Springs:

When ground water comes to the surface and flows freely under natural pressure, it is called a "spring" constitute an important source of water in some geographic areas. Springs may be of two types, swal deep. Swallow springs dry up quickly during summer months, deep springs do not show seasonal fluctu

Surface water:

- **Impounding reservoirs:** These are artificial lakes constructed usually of earthwork or masonry in large quantities of surface water is stored. The area draining into the reservoir is called "Catchme Mumbai, Chennai, Nagpur depend on it.

  Disadvantages: Storing water in long periods may grow algae and other microorganisms.

  Characteristics:
  - It is usually clear, palatable and rank next to rain water in purity.
  - It is soft and considered to be free of pathogenic organisms.

  Impurities: The upland surface water derives its impurities from the catchment area, sources are human habitations, animal keeping and grazing.
- **Rivers:** Cities like Delhi, Kolkata and Allahabad mainly depend on river. Certain amount of self-purifi does occur through dilution, sedimentation, aeration, oxidation, sunlight, plant and animal life.

  Drawback: It is grossly polluted and unfit for drinking without treatment.

  Characteristics:
  - River water is turbid during rainy season.
  - Not safe for drinking, it contains dissolved and suspended impurities.

  Impurities:
  - Derived from surface washings
  - Sewage and sullage water
  - Industrial and trade wastes
  - Custom and habits of the people like bathing, animal washing and disposal of dead, all add to w
- **Tanks:** These are large excavations in which surface water is stored. They are an important sources of supply in some Indian villages. They are often used for washing of clothes, cattle, humans, cooking. Children use it for swimming and there may be regular defecation around the edges which will be w into the tank at the next rains. Hence, tanks are subjected to unlimited possibilities of contamination highly dangerous for drinking purpose.

Parapet wall: There should be a parapet wall up to a height of at least 70–75 cm (28 inches) above the g

Platform: There should be a cement-concrete platform round the well extending at least 1 meter (3 all directions.

Drain: There should be a pucca drain to carry off spilled water to a public drain or a soakage pit.

Covering: The top of the well should be closed by a cement concrete cover because the bulk of the p should not enter into the well.

Hand-pump: Equipped with a hand pump for lifting the water in a sanitary manner.

User responsibility: Strict cleanliness should be enforced in the vicinity of the well, personal ab washing of clothes and animals and dumping of refuse and wastes should be prohibited. Ropes and b from individuals should not be used to draw water from the well.

Water from the well should be carried in clean sanitary vessels to the individual houses.

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- **Rain water:** It is the prime source of all water. A part of rain water sinks into ground to form ground water, part of it evaporates back into the atmosphere, some part form streams and rivers. Which flow ultimately into sea. Some part in water taken up by plants and evaporated in turn by the leaves. These events are called water cycle.
- **Example:** Country like **Gibraltar** depends upon rain water as source of water supply.

Characteristics:
- Rain water is the purest water in nature
- It is clear, bright and sparkling
- It contains traces of dissolved solids

Impurities:
- It tends to become impure as it passes through the atmosphere
- It picks up dust, soot, microorganisms and gases such as carbon dioxide, nitrogen, oxygen and ammonia.

CM3.1: Describe the health hazards of water pollution.

HEALTH HAZARDS OF WATER POLLUTION *(SSUHSA, 2023)*

Agriculture:
- It causes more pollution than industries and municipalities.
- Wide spread use of insecticides and pesticides indiscriminately have led to contamination of ground water aquifers and surface water.
- The water that goes back into rivers and streams after being used for irrigation is often severely degraded by excess nutrients, salinity and pathogens which is unfit for further use.

Pollution through Industrial Activities:
- Industrial wastes generate between 200-400 major chemicals, which are directly dumped into waterways.
- Pollutants such as sulfur dioxide and oxides of nitrogen which combine in atmosphere to form acid rain, causing adverse effect on fresh water and land ecosystems.
- Heavy metals such as lead, mercury and cadmium also percolate in the water.
- Synthetic chemicals like hydrogenated hydrocarbons mixed up with water.
- Organochlorides such as DDT are long-lived and highly toxic in the environment.
- Arsenic mixed up with ground water specially in West Bengal and Bangladesh causing adverse effect on health in the form of **melanosis, keratosis and skin cancers**.
- Fluorides mixed up with water from industries causing fluorosis.

Municipal Pollutions:
- Raw sewage of towns and mega cities are mixed up into rivers.
- New Delhi dumps 200 million liters of raw sewage and 20 million liters of Industrial waste into the Yamuna River every day.
- In Delhi, 30000 cases of viral hepatitis were reported in 1958.
- Water and excreta borne diseases like Cholera, typhoid, hepatitis and diarrheal diseases are endemic in most cities of India.

CM3.3: Describe the etiology and basis of waterborne diseases (jaundice/hepatitis/diarrheal diseases).

Q2. Enumerate the waterborne and water-related diseases. *(WBUHS, 2010, 2020, 2021; AKUB, 2022, 2024; BNMUB, 2012, 2013; ABKUB, 2019; GNSUB, 2022; SAMU, 2004, 2011; SSUHSA, 2013, 2020, 2022, 2023; SMU, 2010, 2011; NU, 2010; MU, 2022; TRIU, 2011, 2023; MUHS, 2019; GOAU, 2023; VNSGUS, 2023; SDVPG, 2023)*

Ans: Water-related diseases may be classified as follows:
- **Waterborne diseases** include primarily the diseases caused by organisms.

Those **caused by the presence of infective agent**:

Agent	Diseases
Viral	Viral hepatitis A, hepatitis E, poliomyelitis, rotavirus diarrhea in infants, etc.
Bacterial	Typhoid and paratyphoid fever, bacillary dysentery/*Escherichia coli* diarrhea, cholera, etc.
Protozoal	Amoebiasis/giardiasis, etc.
Helminthic	Roundworm, threadworm, hydatid disease, etc.
Snail	Schistosomiasis
Cyclops	Guinea worm, fish tape worm, etc.

- **Water-related diseases (chemical hazards):** The chemical contamination of water is done by industrial and agricultural wastes and ultimately mixed in public water supply. These pollutants are detergent solvents, cyanides, heavy metal, minerals and organic acids, bleaching agents and dyes, pig sulfides, ammonia. These chemical pollutants accumulated by fish which used as human foods.
  - *Dental health:* Deficiency of fluoride, lesser than 1 mg per liter, results in dental caries and excess fluoride results in dental fluorosis among children and skeletal fluorosis is seen among adults and e
  - *Cyanosis in infants:* Excess of nitrate can result in infantile methemoglobinemia.
  - Deficiency of iodine results in goiter.
  - Excess of lead results in lead poisoning.
  - The salts of lead, iron and zinc are responsible for constipation and colicky abdomen.

HEPATITIS RELATED QUESTIONS AND ANSWERS

Hepatitis A: It is an acute infectious disease caused by hepatitis A virus. It usually starts with nonspe symptoms such as fever, chills, headache, fatigue, generalized weakness, aches, pain, followed by anor nausea, vomiting, dark urine and jaundice. The disease is benign with complete recovery in several we The case fatality rate of icteric cases is less than 0.1%.

Mode of transmission:
- Fecal-oral route
- Parenteral route
- Sexual transmission

Incubation period: 10–50 days (usually 14–28 days).

Diagnosis: Tests for abnormal liver function, such as serum alanine aminotransferases (ALT) and bilir along with clinical, pathologic and epidemiological findings.

Prevention and control:
- Control of reservoir
- Control of transmission
- Control of susceptible population

Two types of hepatitis A vaccines are currently available:
1. Inactivated hepatitis A vaccine are used after 12 months of age. Two doses of vaccine administered deltoid with an interval of 6–12 months extended up to 18–36 months, can be used with other vacci protective efficacy is about 94%.
2. Live attenuated vaccine is administered as a single subcutaneous dose.

Q3. Describe the epidemiology, prevention and control of Hepatitis B in India.

(DU, 2016, 2003; SSUHSA, 2011, 2023; TRIU, 2

Ans: *It is well known fact that epidemiology deals with distribution and determinants of health or health-rela states and application of the knowledge gained from the study of distribution and determinants to red the burden of health problem.*

Epidemiological Determinants of Hepatitis B

Agent Factors:

Hepatitis B virus (HBV) is a complex, 42 nm, double shelled DNA virus, originally known as **"Dane particle"**. It replicates in liver cells. HBV occurs in three morphological forms in the serum of patients, (a) Small spherical particles with an average diameter of 22 nm. These particles are antigenic and can produce surface antibodies. (b) Tubules of varying length and diameter, and (c) Dane particle which corresponds morphologically HBV. But only Dane particle is infectious.

Reservoir of infection: Man is the only reservoir of infection which can be spread either from carriers or from cases. The continued survival of infection is due to the large number of individuals who are carriers of virus. Cases may range from inapparent to symptomatic cases.

Infective materials: Contaminated blood is the main source of infection. The virus is also found in body secretions like saliva, vaginal secretions and semen of infected persons.

Resistance: The virus is quite stable and capable of surviving for at least 7 days in environmental surfaces. It can be rapidly destroyed by sodium hypochlorite.

Period of communicability: The virus is present in the blood during the incubation period (for a month before Jaundice) and acute phase of the disease. Period of communicability is usually several months (occasionally years in chronic carriers) or until disappearance of HbsAg and appearance of surface antibody.

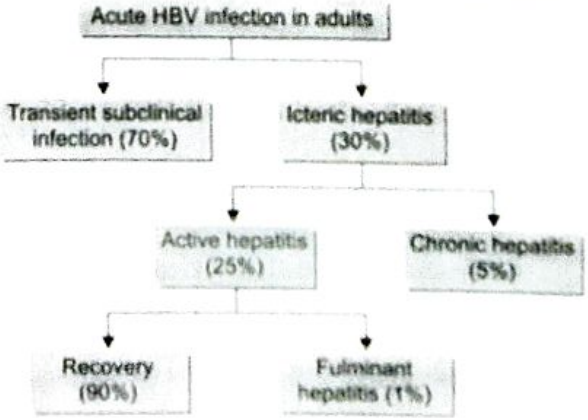
Host Factors:

- Acute hepatitis of HBV infection occurs in 1% perinatal, 10% early childhood (1–5 years of age) and 30% of late HBV infections. Mortality from fulminant hepatitis B is around 70%. The development of chronic HBC infection is inversely related to age and occurs in about 80–90% of persons infected perinatally, in 30% infected in early childhood (< 6 years) and in 5% infected after 6 years of age.
- **High-risk groups:** The annual incidence of HBV infection in surgeons is estimated to be 50 times greater than in general population and more than twice that of other physicians. Other high-risk groups are recipients of blood transfusions, recipients of solid organ transplants, health care and laboratory personnel, homosexuals, prostitutes, injectable drugs users, infants of HBV carrier mothers and immune-compromised patients, etc.
- **Hepatitis B and HIV infections:** It is estimated that 10% of the 40 million people infected with HIV worldwide are also co-infected with HBV. Presence of HIV increases the risk of developing HBV associated liver cirrhosis and hepatocellular carcinoma.
- Hepatitis B virus has three distinct antigens—surface antigen known as "Australia antigen" (HBsAg), a core antigen (HBcAg) and "e" antigen (HBeAg) and they stimulates production of corresponding antibody. These, antigen and their antibodies constitute a very useful markers of HBV infection. Patients are usually having more than one HBV markers.

Natural History and Clinical Presentations:

See **Flowchart 3.1** for natural history and clinical presentations.

Flowchart 3.1: Natural history and clinical presentations



Mode of Transmission

- **Parenteral route:** HBV infection is essentially a blood borne infection. It is transmitted by infected blood and blood products through transfusions, dialysis, contaminated syringes and needles, surgical and dental procedures, immunization, tattooing, ear piercing, nose piercing, ritual circumcision, acupuncture, etc.

- **Perinatal transmission:** Spread of infection from HBV carrier mothers to their babies appe... important factor for the high prevalence of HBV infection in some regions, particularly China and ... The risk of infection varies from country to country unless vaccinated at birth.
- **Sexual transmission:** Various body fluids including saliva, vaginal, menstrual and seminal fluids ha... implicated as vehicles of human transmission. The sexually promiscuous, particularly male homo... are at very high risk of infection with HBV.
- **Others routes:** Child to child transmission often called horizontal transmission.

Incubation period: 30 to 180 days. Average is about 75 days.

Prevention and Control

As there is no specific treatment of HBV infection so prevention is the main aim of managing the inf...

- **Hepatitis B vaccine:** For neonate and children.
  - At birth or as early as possible till one year of age, 0.5 mL of vaccine is given intramuscul... anterolateral aspect of left mid-thigh.
  - *Pentavalent vaccine:* It is a combined vaccine giving against diphtheria, pertussis, tetanus, hep... vaccine and *Haemophilus influenzae* type b. Given at 6, 10 and 14 weeks, 0.5 mL of vaccine intramus... at anterolateral aspect of left mid-thigh.
  - *For adults:* Vaccine is given at 0, 1 and 6 month, 1 mL, intramuscularly, deltoid area.

Hepatitis B immunoglobulin (HBIG): High-risk group like surgeons, nurses, lab workers, newborn int... carrier mothers, sexual contacts of acute Hepatitis B patients and patients need protection against he... B infection after liver transplantation.

Recommended dose is 0.05 to 0.07 mL/kg of body weight, two doses are given at 30 days apart. It provides short-term passive protection which last approximately 3 months.

This should be given within 24 hours of exposure, if possible.

Passive and active immunization: Simultaneous administration of HBIG and hepatitis B vaccine is effic... than HBIG alone. Hepatitis B vaccine should be given intramuscularly, 1.0 mL within 7 days of expos...

- **Other measures:** All blood donors should be screened for HBsAg. Voluntary blood donation shou... encouraged.

  Treatment:
  - No specific treatment for acute hepatitis B.
  - Care is aimed at maintaining comfort and adequate nutrition balance, including replacement of f... lost from vomiting and diarrhea.
  - Chronic hepatitis B infection can be treated with drugs. Treatment can reduce the progress... cirrhosis, reduce incidence of liver cancer and improve long-term survival.
  - WHO recommended oral treatment Tenofovir or entecavir, these are the most potent drugs to supp... hepatitis B virus.

SHORT NOTES AND RELEVANT QUESTIONS ON HEPATITIS

Q4a. Hepatitis B infection should be considered more dangerous than HIV infection—Justify.
(WBUHS ...

Ans: Man is the only reservoir of hepatitis B infection which can be spread either from carriers or from case... continued survival of infection is due to large number of individuals who are carriers of virus. The virus is ... stable and capable of surviving for at least 7 days on environmental surfaces. The presence of HIV mark... increases the risk of developing HBV associated liver cirrhosis and hepatocellular carcinoma. The morta... rate increases among HIV positive people due to HBV co-infection both before and after commencem... of highly active anti-retroviral therapy.

Q4b. Australia antigen. *(RGUHS, 2009)*

Ans: Australia antigen is a surface antigen of hepatitis B virus. It is designated as HBsAg.

Characteristics:

- It stimulated production of surface antibody, i.e., anti-HBsAg.
- It appears much before the biochemical changes of liver damage become evident.
- It persists throughout the clinical illness and clears after 4–6 months.
- It persistence after acute illness is indicative of chronic hepatitis.

Significance: Detective of surface antigen is the earliest evidence of HBV infection. Detection of Australia antigen establishes hepatitis B infection and implies active infection and infectivity.

Q4c. Serological marker of hepatitis B. *(BUMP, 2013)*

Ans: Hepatitis B virus has three distinct antigens. Surface antigen is known as "Australia antigen" (HBsAg) and others are a core antigen (HBcAg) and "e" antigen (HBeAg). They stimulate production of corresponding antibodies, e.g., surface antibody (anti-HBs), core antibody (anti-HBc) and "e" antibody (anti-HBe). These antigens and their antibodies constitute very useful markers of HBV infection. Patients generally have more than one HBV markers in presence of Hepatitis B infection **(Fig. 3.1)**.

Time schedule of different biomarkers of Hepatitis B:

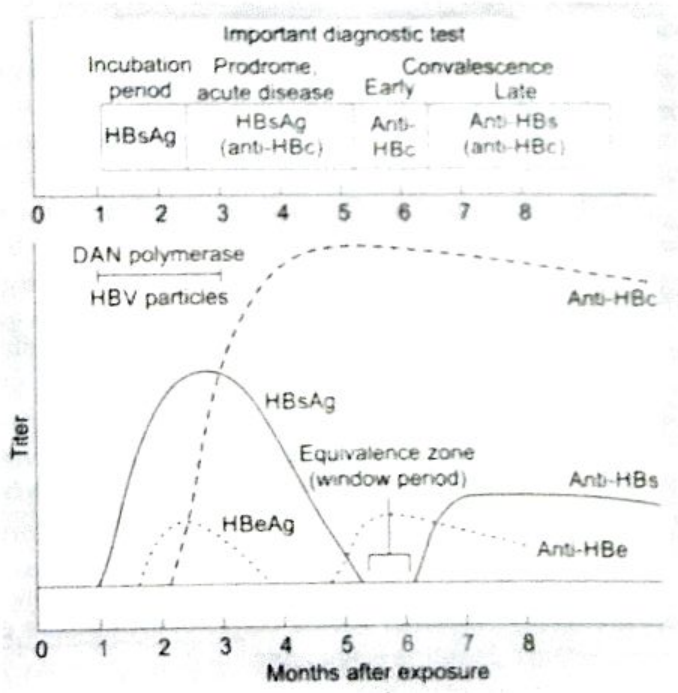


Fig. 3.1: Course of a typical acute hepatitis.

Q5a. Describe the epidemiology (epidemiological determinants, agent, host, environment) of diarrheal diseases. Describe the important preventive measures for control of diarrhea in the community specially children. *(SAMU, 2008; BUMP, 2008; BNMUB, 2017)*

Ans. Epidemiology of Diarrheal Diseases:

Epidemiological determinants are—agent, host and environment.

Agent factors:

Viruses	*Bacteria*	*Others*
• Rotavirus	• *Shigella*	• *E. histolytica*
• Adenoviruses	• *Salmonella*	• *Giardia intestinalis*
• Caliciviruses	• *Vibrio cholerae*	• Trichuriasis
• Coronaviruses	• *Campylobacter jejuni*	• *Cryptosporidium*
• Enteroviruses	• *Escherichia coli*	• Intestinal worms
• Cytomegalovirus	• *Staphylococcus aureus*	
	• *Bacillus cereus*	
	• *Chlamydia*	

Host Factors: Diarrhea is most common in between 6 months to 12 years. At the time of weaning the incid is highest in 6–11 years age groups. When infants starts to crawl, exposed to contaminated food, contact human and animal feces. Also common in child fed on cow's milk or infant feeding formulas. Premat malnutrition, infection, immunodeficiency, poverty, lack of personal hygiene and domestic hygiene incorrect feeding practices, etc., are some of the contributory factors.

Environmental factor: Bacterial diarrhea occur frequently in summer and rainy season whereas the v specially the rotavirus peak during winter.

Mode of Transmission:

Diarrhea primarily transmitted through fecal-oral route. Fecal-oral transmission may be waterborne fo borne, direct transmission such as fingers, dirts, fomites, etc.

The intervention measures recommended by WHO classified as:

- **Short-term:** Appropriate clinical management
- **Long-term:**
  - Better MCH care practices
  - Preventive strategies
  - Prevention of diarrheal epidemics

Concept/Meaning of Diarrhea:

Diarrhea is the passage of unusually loose or watery stools, usually at least three times in 24 hours.

Consistency of the stools rather than the number that is most important.

Character of stool: Blood mixed with stool and presence of mucus.

Frequent passing of formed stools is not diarrhea. Babies fed only breastmilk often pass loose, "pasty" stools this also is not diarrhea.

Types of Diarrhea:

Acute watery diarrhea (including cholera) which lasts several hours or days: The main danger is dehydration; weight loss also occurs if feeding is not continued.

Acute bloody diarrhea which is also called dysentery: The main dangers are damage of the intestinal mucosa, sepsis and malnutrition; other complications, including dehydration, may also occur.

Persistent diarrhea which lasts 14 days or longer: The main danger is malnutrition and serious non intestinal infection; dehydration may also occur.

Dehydration is classified as severe dehydration, some dehydration and no dehydration according to presence or absence of certain clinical signs. As Per IMNCI program, the classification is given below:

Signs	Classify as	Treatment plan
Two of the following signs: • Lethargic or unconsciousness • Sunken eyes • Cannot drink • Skin pinch goes back very slowly	Severe dehydration	**Plan C** Home-made oral rehydration solution
Two of the following signs: • Restless/irritable • Sunken eyes • Drinks eagerly • Skin pinch goes back slowly	Some dehydration	**Plan B** Oral rehydration salt (ORS)
Not enough signs to classify as some or severe dehydration	No dehydration	**Plan A** IV infusion

Note: Skin pinch goes back by 2 seconds usually.

Appropriate Clinical Management:
It was firmly established that oral rehydration therapy recommended by WHO can be used successfully in all the countries, in all age groups and all cases of diarrheal diseases. It was also an established fact that 90–95 cases can be treated by ORS.

Q5b. Give brief description of oral rehydration therapy (ORT). *(BNMUB, 2017; RGUHS, 2008, 2014, 2024; ABKUB, 2002; MGUB, 2023)*

Ans: Oral rehydration therapy (ORT) is a type of fluid replacement used to prevent and treat dehydration, especially that due to diarrhea. It involves drinking water with modest amounts of sugar and salts, specifically sodium and potassium. Therapy should routinely include the use of zinc supplements. Use of oral rehydration therapy has been estimated to decrease the risk of death from diarrhea by up to 93%. The recommended formulation includes sodium chloride, sodium citrate, potassium chloride, and glucose. Glucose may be replaced by sucrose and sodium citrate may be replaced by sodium bicarbonate, if not available. It works as glucose increases the uptake of sodium and thus water by the intestines. A number of other formulations are also available including versions that can be made at home. **Oral rehydration therapy was developed in the 1940s, but did not come into common use until the 1970s by World Health Organization. They listed in Essential Medicines, as a safest and most effective medicines needed in a health system.** The diarrheal diseases control program was initiated in India in 1978 with the objectives of reducing the mortality and morbidity due to diarrheal diseases. The diarrheal diseases control (DDC) program was started by WHO in 1980. There were short term and long-term intervention measures in prevention and control of the disease mainly concentrated on "Oral rehydration therapy".

Indications for use of ORS:
- Diarrhea with some dehydration
- Diarrhea with no dehydration
- As an adjunct to severe dehydration.

Fig. 3.2: Low osmolarity ORS.

Osmolarity of **previous conventional ORS** is **311** mmoles/Liter and sodium bicarbonate based.

Osmolarity of **reduced (low)** osmolarity ORS **(Fig. 3.2)** is **245** mmoles/liter and inclusion of trisodium citrate in the place of sodium bicarbonate make the product more stable and causing less stool output in high output diarrhea in children.

Advantages of **low osmolarity** ORS over conventional ORS is, it decreases solute load over kidney and helps in absorption of water, thus produces formed stool.

Plan A:

Q5c. Common home-made oral rehydration solutions. *(WBUHS, 2010; RGUHS, 2001; TDMGRMU, SAMU, 2022; SSUHSA,*

Ans: In diarrheal disease absorption of sodium and other electrolytes is impaired but not glucose. When glucose is given along with sodium chloride and water, absorption of salts and water becomes faster; thereby corrects and prevents dehydration.

Four important criteria should be the guiding principles of home-made oral rehydration solution. It should be **safe.**

It should not be hyperosmolar. It should be **effective.** The molar ratio of glucose (derived from starch or sugar) and sodium should be at least 1:1. It should be **easy to prepare**. It should be **acceptable** to the population.

Administration of salt sugar solution (SSS) as HAF constitutes oral rehydration therapy (ORT). ORT does not stop diarrhea but maintain hydration. In case of diarrheal diseases, assessment is done on the basis of degree of dehydration. For prevention of dehydration home-made solution is used. There are three rules for control and prevention of diarrhea. They are: (a) increase fluid intake, (b) continue feeds (BF or food) to prevent malnutrition and (c) look for signs of dehydration, restless, lethargic, presence of thirst, skin pinch back slowly, scanty urine, etc.

- **Best HAF is "Salt sugar solution (SSS)":** It is prepared as follows; for one liter of SSS, **6 level spoons of sugar + one level spoon of salt + one liter of drinking water,** if WHO mixture of salts is not available. Proper ratio should be followed otherwise it may be hyperosmolar to cause harm.
- **Home available fluids (HAF):** HAFs are appropriate for children with no signs of dehydration and given frequently after each and every loose motion to prevent dehydration. Examples are rice water, dal or soup water with salt, butter milk (lassi) with salt and certain soups with salt, coconut water, rice kanji, or just plain water, weak tea, etc. These fluids are effective when given along with food.

Plan B:

Child should be kept under observation in the hospital/health center for 4 hours and given prepared oral rehydration salt (ORS) solution during the period.

Purpose: To correct fluid deficit and to provide for ongoing losses and normal daily requirement.

Preparation of ORS: Hand is washed with water and soap. After that, a container is taken, which can contain 1 liter of water. Then, the ORS packet is torn and full amount of the ORS is placed in the container. One liter of water is then poured over ORS and stirred well with long handed spoon. The solution should be made fresh daily used within 24 hours and container should be covered every time. Once it is prepared, it should not be boiled it will alter nutritive value. **Amount: 75 mL/kg** ORS solution is given in first 4 hours. If the child's weight is not known, the approximate deficit may be determined on the basis of age. The actual amount given will depend on the patients desire to drink and by surveillance of signs of dehydration. If the child wants to drink more ORS solution than the estimated amount and does not vomit, there can be no harm in feeding him/her more.

According to age the approximate doses of ORS are as follows:

Age	Amount
<1 year	500 mL
1–2 years	750 mL
2–4 years	1,000 mL
4–10 years	1,500 mL

Zinc supplementation:

- It reduces the duration and severity of acute diarrhea.
- Doses: Below 6 months daily 10 mg for 10–14 days.
- Above 6 months daily 20 mg for 10–14 days.
- After 4 hours, child is reassessed and dehydration status is again classified.
- If the child's dehydration remains same, ORS solution is continued for another 4 hours.

Plan C:

If the child is worsening and develops severe dehydration, IV fluid is administered. IV infusion recommended for diarrhea are as follows:

- **Ringer lactate solution is preferable solution.** It supplies adequate concentrations of sodium and potassium and lactate yields bicarbonate for correction of acidosis.
- Normal saline solution is acceptable but it is the poorest fluid because it will not correct acidosis and not replace potassium losses.
- **But plain glucose and dextrose solution is undesirable it contains only water and glucose.**

Rate and quantities of IV infusion for correcting severe dehydration:

Age	First 30 mL/kg	Afterwards 70 mL/kg	Total
Infants	In 1 hour	In 5 hours	100 mL/kg 6 hours
2 years	In 30 minutes	Next 2 and half hours	100 mL/kg 3 hours

If the patient can drink, administration of ORS solution must also be started along with IV infusion.

- The patient must be assessed after completion of therapy. If signs of severe dehydration disappear treatment should be continued for some or no dehydration according to dehydration status.
- If the child has no dehydration after 4 hours, treatment with ORS solution is advocated patient is managed according to plan A. Child is discharged along with 2 packets of ORS to the mother/attendant.

Maintenance therapy: After correction of initial fluid and electrolyte deficit, oral fluid should be used for maintenance therapy hence thirst is an adequate guide for fluid needs. The general principle is that the oral fluid intake should be equal the rate of continuing stool loss.

Appropriate feeding: During the episodes of diarrhea, normal food intake should be promoted whatever the age, is able to eat. Exclusive breastfeeding continued. Feeding continued along with oral rehydration solution given after each liquid stool. It protects further diarrheal episodes.

Chemotherapy: No antibiotics used except bacterial diarrhea caused by shigella.

During discharged, mother is counseled about following issues:

- How to prepare ORS solution at home.
- When ORS solution is offered to her children and what amount. (100–200 mL of ORS solution is offered to the child after each purgation).
- Mother should be taught about the danger signs of dehydration and when to return health center for follow-up.

The danger signs/signals are as follows:

- Unconsciousness
- Not able to drink/eating or drinking poorly
- Very sunken eyes
- Increased skin turgor
- Urine not passed
- Blood mixed with stool
- Very weak radial pulse
- Repeated vomiting
- Develops fever
- Blood in the stool
- Child does not get better in 3 days

- **Home available fluids (HAF):** Food-based solution like rice water, dal or dal water with salt, curd salt. HAF should be given frequently and also after loose stool to prevent dehydration.
- **Appropriate feeding practice:** Diet should contain all the macro and micronutrients in adequate a and immunization of child as per schedule.
- Advice for prevention of future recurrence

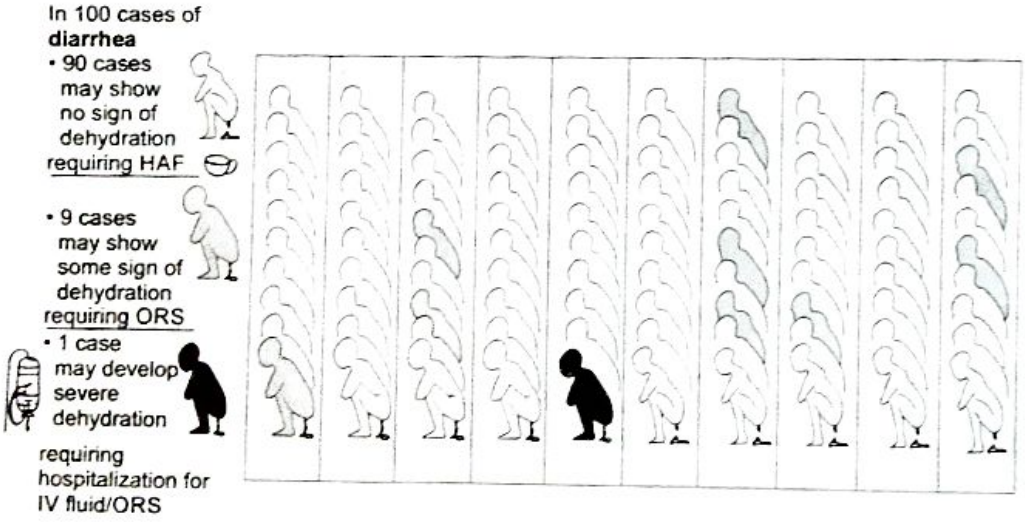


Fig. 3.3: Consequence of 100 children with diarrhea.

In 100 case of diarrhea (Fig. 3.3), 90 cases may show no sign of dehydration and requiring home available fluids (HAF), 9 cases my show some dehydration, requiring ORS and 1 case requiring hospitalization for IV fluid/ORS.

Better MCH care practices:

- **Maternal nutrition:** Proper prenatal nutrition will reduce the birth weight. Both prenatal and postn nutrition will improve the quality of breast milk.
- **Child nutrition:** Promotion of breastfeeding—Breastfeeding are likely to reduce the diarrheal disease infants. The breast-fed child is less risk of severe diarrhea and death than bottlefed child. Breastfeed should be continued as long as possible.
  - *Appropriate weaning practices:* The child should be weaned with locally available foods after 6 mon Poor weaning practices are major risk factors for diarrhea.
  - *Supplementary feeding:* It should be started from 6–59 months
  - *Vitamin A supplementation and immunization:* It prevent mortality and morbidity due to diarrh diseases. So vitamin A in oil should be started from 9 completed months with measles vaccine a

there after every 6 month interval with a total of 9 doses up to 5 years of age. Apart from that all vaccine should be given in appropriate doses up to 5 years.

Rotavirus vaccine: Rotavirus vaccine is a live attenuated oral liquid vaccine and does not require reconstitution. Each dose is of 5 drops (0.5 mL). It was launched in March 2016 initially in 4 four states. Currently it has been introduced in nine states of India.

Preventive strategies:

Sanitation: Safe water-drinking safe water and safe storage of water at home is necessary to prevent diarrhea. Water to be stored in clean covered vessels and never dip hand or glass in water container for taking water. Without an adequate supply of clean water close homes, it is extremely difficult to promote personal and domestic hygiene.

Hand washing: Hand washing with soap and water before eating, feeding and after going to toilet.

Clean food: Eating clean food and freshly cooked food prevents diarrhea.

Toilet: The families should have sanitary latrine with functioning condition at least 10 meter away from water supply source.

Regular growth monitoring at monthly interval at AWC for detection and correction of undernutrition, which is a risk factor for diarrhea.

Health education: It is an important part of the health worker's job for preventing diarrhea by convincing and helping community members to adopt and maintain important practices such as breastfeeding, improved weaning, clean drinking water, use of functioning latrine and proper disposal of stool for young children, etc.

Fly control: Breeding places of flies should be controlled which is associated with human and animal feces.

Prevention of diarrheal epidemics: For any epidemic situation it is desired to have an orderly procedure and practical guidelines. Same steps will be followed in diarrheal epidemics also:

- Verification of diagnosis
- Confirmation of the existence of an epidemic
- Defining the population at risk
- Rapid search for cases and their characteristics
- Data analysis
- Formulation of hypothesis
- Testing of hypothesis
- Evaluation of ecological factors
- Further investigation of population at risk
- Writing a report

Q5d. ORS/WHO recommended ORS. *(BNMUB, 2012, 2016, 2018; SAMU, 2010; RGUHS, 2004; TDMGRMU, 2008; DU, 2013; SMU, 2015; NU, 2014)*/**Low osmolarity ORS has many advantages over previously used ORS—Justify.** *(WBUHS, 2017; TMGRMU, 2012; ABKUB, 2019; MGUB, 2023; VNSGUS, 2023)*/**Reduced osmolarity ORS** *(MGUB, 2024)*

Ans: ORS is useful for treatment of diarrhea with dehydration.

Indications:

- Diarrhea with some dehydration
- Diarrhea with no dehydration
- As an adjunct to severe dehydration.

Composition of reduced osmolarity ORS (grams/Liter)

The new ORS was launched by WHO in January 2004 and in India in June 2004.

Composition of reduced/low osmolarity ORS (grams/Liter)

Ingredients	*Unit (g/L)*
Sodium chloride	2.6
Potassium chloride	1.5
Trisodium citrate dehydrate	2.9
Dextrose anhydrous	13.5
Total weight	**20.5**

Composition of reduced/low osmolarity ORS (mmoles/liter)

Ingredients	*Unit (mmoles/L)*
Sodium	75
Potassium	20
Chloride	65
Citrate	10
Glucose	75
Total osmolarity	**245**

Composition of previous conventional ORS (grams/liter)

Ingredients	*Unit (g/L)*
Sodium chloride	3.5
Potassium chloride	1.5
Trisodium citrate dehydrate	2.9
Dextrose anhydrous	20.0
Total weight	**27.9**

Composition of previous conventional ORS (mmoles/liter)

Ingredients	*Unit (mmoles/L)*
Sodium	90
Potassium	20
Chloride	80
Citrate	10
Glucose	111
Total osmolarity	**311**

This is called Low osmolar ORS, because osmolarity of previous conventional ORS is 311 mmoles/liter.

Advantages of low osmolar ORS over conventional ORS:

- It decreases solute load over kidney.
- It helps in absorption of water.
- It is safe and effective.
- It reduces stool output or stool volume by about 25% when compared to compared to original WHO UNICEF ORS solution, thus produces formed stool.
- It reduces vomiting by almost 30%.
- It reduces the need for unscheduled IV therapy by more than 30%.

Role of individual component in ORS:

- **Sodium and chloride** replaces electrolyte and maintain electrolyte balance
- **Glucose** facilitates absorption of sodium
- **Potassium** corrects hypokalemia
- **Trisodium citrate** makes the ORS more stable resulted in less stool output and also increase intestinal absorption of sodium and water.

Preparation of ORS: Hand is washed with water and soap. After that, a container is taken, which can contain 1 liter of water. Then, the ORS packet is torn and full amount of the ORS is placed in the container. One liter of water is then poured over ORS and stirred well with long handed spoon. This container is now covered and should be consumed within 24 hours. Once it is prepared, it should not be boiled it will alter nutritive value.

Merits of ORS:

- 90–95% of acute watery diarrhea can be managed with ORS.
- Preparation is easy and administration is simple and safe.
- Prevents hospitalization and reduces cost of treatment.
- It minimizes the use of antibiotics.
- Free from side effects.
- Reduces the mortality due to dehydration.

Limitation: It cannot be given in case of persistent vomiting, paralytic ileus, marked abdominal distension and in unconscious state.

Q5e. Zinc therapy is beneficial in management of diarrhea—Explain. *(WBUHS, 2016, 2023; BNMUB, 2020)*/ **Zinc is given with ORS in treatment of diarrhea-Justify.** *(WBUHS, 2018, 2020; BNMUB, 2023)*

Ans: Zinc therapy in an acute episode of diarrhea reduces the duration and severity of diarrhea. Zinc supplementation given for 10–14 days lower the incidence of diarrhea in the following 2–3 months. WHO and UNICEF recommended daily 10 mg of zinc for infants under 6 months of age and 20 mg for more than 6 months old children for 10–14 days.

Thus, zinc therapy is beneficial in management of diarrhea along with ORS.

Q6. A 2-year-old child presented with history of fre quent passage of loose stool for 2 days, irritability, excess thirst and skin turgor was going back slowly. Classify the dehydration with proper justification in accordance with national program guidelines. Outline the management of child.

(WBUHS, 2011)

Q7. A 9-month-old child comes to a sub-centre with the complaint of loose watery stools since last 3 days. On examination by health worker, the child was found to be irritable, sunken eyes and skin turgor going back slowly, normal weight, no anemia. Classify the illness according to IMNCI and discuss the management accordingly. *(BNMUB, 2013; WBUHS, 2019)*

Q8. A 2-year-old child with history of passing watery stool every 2–3 hours, who is restless with dry mouth and sunken eyes has been brought to the sub-center. How does a health worker assess, classify and manage the case? What advice she should give to mother for prevention of occurrence of such condition in future? *(WBUHS, 2008)*

Q9. Marjina an 18-month-old girl had been brought to the OPD of a rural PHC by her mother with complaints of passage of loose stool 5 times per day for last 1 day. On examination she was found to be irritable with intense thirst, restless, sunken eyes and dry tongue. Classify the dehydration status of the child with justification and discuss the management accordingly. *(BNMUB, 2014)*

Q10. An 11-month-old girl child attended a subcenter complaining of loose watery stool without blo since last 5 days. On examination by the ANM, she found to be irritable with sunken eyes, no pa normal weight and no history of convulsion. Classify the illness according to IMNCI and write du the management accordingly. *(WBUHS*

Q11. A 6-month-old child was brought by the mother at OPD, presenting with loose stool for more th three times with vomiting from last night. On examination, the child was found restless and drinki eagerly. Classify diarrhea. Outline the management. What information you want to make the moth aware of the situation? *(WBUHS*

Ans: First of all assessment of dehydration, then construct the answer as per different plan described in the

Q11a. Botulism *(GOAU, 20*

Ans: Botulism derives from the Latin word botulus means. Most serious among the food poisoning cases but re It kills 2/3rd of its victims.

- *Agent: Clostridium botulinum* type A, B or E, liberates exotoxin.
- *Source:* Widely distributed in soil, dust and intestinal tract of animals and enters food as spores. Fo responsible for it such as home-canned vegetables, smoked or picked fish, home-made cheese.
- *Incubation period:* 18 to 36 hours
- *Mechanism of food poisoning:* The toxin performed in food under anaerobic condition. It acts on parasympathetic nervous system.
- *Clinical features:* Gastrointestinal symptoms are very less. The prominent symptoms are dysphag diplopia, ptosis, dysarthria, blurring of vision, muscle weakness and quadriplegia. Fever is generall absent and consciousness is retained, death occurring 4–8 days later due respiratory or cardiac failur
- *Treatment:* Guanidine hydrochloride given orally in doses of 15 to 40 mg/kg body weight can revers neuromuscular block.
- Active and passive immunization:
  a. Botulinum toxoid is available
  b. Anti-toxin given with a dose varies from 50000 to 100000 units IV.

CM3.2: Describe water purification processes.

Q12a. How will you ensure safe water (portable water) to an urban area? *(WBUHS, 2010, 2020, 20 BNMUB, 2011, 2012, 2013; ABKUB, 2019; VKSUAB, 2019; SAMU, 201 SSUHSA, 2013; SMU, 2010, 2011; NU, 2010; TRIU, 2011; MUHS, 201*

Safe water supply can be done in following ways:

A. Selection of the source of the water: In selecting a source, attention must be given, which may influenc continued suitability of the source. Other considerations include the following:

- *Quantity:* Quantity of the water should be sufficient to meet the continuing water demand, taking in account daily and seasonal variation.
- *Quality:* It should be such that with appropriate treatment, it meets drinking water standards.
- *Protection:* Watershed must be protected from pollution with human excreta, industrial discharge, et
- *Feasibility:* The source should be available at reasonable cost.

Potential new source should be examined in the field by qualified and experienced sanitary surveyo and physical, bacteriological and chemical analysis should be carried out.

B. Distribution of water: It may be continuous or intermittent supply. Intermittent supply has some adver effects. Pipes may be empty during times of emergency in intermittent supply of water. When pipes are empty, there is negative pressure and by what is known as back-siphoning, bacteria and foul gases ma be sucked through leaky joints.

C. Purification of water in large scale *(BNMUB, 2019; GOAU, 2023; AKUB, 2023; TRIU, 2023)*

The components of typical water purification system comprise one or more of the following measures:

- Storage
- Filtration
- Disinfection

a. **Storage:** As a result of storage, a very considerable amount of purification takes place like physical, chemical and bacteriological.

b. **Filtration:** Two types of filters are used for water purification:

1. Slow sand filter/biological filter.
2. Rapid sand filter/mechanical filter.

1. **Slow sand filter/biological filter** *(BNMUB, 2015, 2016, MUHS, 2019)*

Elements of slow sand filter are:

- Supernatant water (1–1.5 meter)
- A bed of graded sand (1 meter)
- Under drainage system
- Filter control

Advantages of slow sand filter:

- Simple to construct and operate.
- Cost of construction is cheaper.
- Physical, chemical, bacteriological quality of the water is very high.

Disadvantages of slow sand filter:

- It occupies large surface area.
- Rate of filtration is slower.

2. **Rapid sand filter/mechanical filter:** Before filtration, preliminary treatment are:

- Coagulation
- Rapid mixing
- Flocculation
- Sedimentation

Advantages of rapid sand filter:

- It can deal with raw water directly.
- Filter beds occupy less space.
- Filtration is rapid.
- Washing of the filter is easy.

Disadvantages of rapid sand filter:

- It is costly and difficult to construct.
- It requires preliminary treatment.

c. **Disinfection:** It can be done in following ways:

Chlorination: It is one of the great advances in water purification. It oxidizes iron, manganese, hydrogen sulfide, destroys some taste and odor producing substances, control algae and aids coagulation. Action of chlorine:

$$H_2O + Cl_2 = HCl + HOCl \quad HOCL = H + Cl$$

Disinfecting action of chlorine is due to hypochlorous acid and partly due to hypochlorite ions. Minimum recommended concentration of free residual chlorine is 0.5 mg/L.

Method of chlorination: For disinfecting large bodies of water, chlorine is applied either as: a. Chlorine gas, b. Chloramines and c. Perchloron.

- **Ozonation:** It is a powerful oxidant and has mainly used in water treatment including oxidation of organic chemical. It has not any residual action.
- **Ultraviolet rays:** Organisms are killed in this process.

Q12b. Difference between slow sand filter and rapid sand filter. *(WBUHS, 2023; ABKUB, 2023; VKSUAB*

Point of difference	Slow sand filter	Rapid sand filter
Space	Occupies large area	Occupies very little space
Rate of filtration	2–3 m.g.a.d	200 m.g.a.d
Effective size of sand	0.2–0.3 mm	0.4–0.7 mm
Preliminary treatment	Plain sedimentation	Chemical coagulation and sedimentation
Washing	By scraping the sand bed	By back-washing
Operation	Less skilled	Highly skilled
Loss of head allowed	4 feet	6–8 feet
Removal of turbidity	Good	Good
Removal of color	Fair	Good
Removal of bacteria	99.9–99.99 percent	98–99 percent

Q13. Describe purification of water at household level/small scale. *(WBUHS, 2021, 2023; BNMUB VKSUAB, 2018; GITAMAP, 2023; SSUHSA, 2020, 2022 DU, 2016, 2012; SMU, 2015, 2010; MUHS, 2019; KIMS*

Ans: The following methods are generally available for purifying water on an individual or domestic (house level) scale. These methods can be used singly or in combination.

A. **Boiling:** Boiling is a satisfactory method of purifying water for household purposes. The water mus brought to a "rolling boil" for 10–20 minutes for its effective action. It kills all bacteria, spores, cysts ova and yields sterilized water. Boiling also removes temporary hardness by driving off carbon dio and precipitating the calcium carbonate.

B. **Chemical disinfection:**

- *Bleaching powder:* Bleaching powder or chlorinated lime ($CaOCl_2$) is a white amorphous powder w a pungent smell chlorine. When freshly made, it contains about 33 percent of "available chlorin is unstable compound, on exposure to air, light and moisture it rapidly loses its chlorine content. S when mixed with excess of lime, its strength retains hence called "stabilized bleach". It should be sto in a dark, cool and dry place in a closed container that is resistant to corrosion. The chlorine conten bleaching powder should be checked frequently.
- *Chlorine solution:* Chlorine solution may be prepared from bleaching powder. If 4 kg of bleachi powder with 25% available chlorine is mixed with 20 liter of water, it will give a 5% solution of chlori
- *High test hypochlorite:* High test hypochlorite (HTH) or perchloron is a calcium compound whi contains 60 to 70 percent available chlorine. It is more stable than bleaching powder and deteriorate much less on storage. Solutions prepared from HTH are also used for water disinfection.
- *Chlorine tablets:* Under various trade names (viz. halazone tablets) are available in the market. They ar quite good for disinfecting small quantities of water, but they are costly. The National Environmenta Engineering Research Institute, Nagpur formulated a new type of chlorine tablet which is 15 time better than ordinary halogen tablets. These tables are manufactured in various strengths and are no available in plenty, in the Indian market at a cheap rate. A single tablet of 0.5 gm is sufficient to disinfe 20 Liter of water.
- *Potassium permanganate:* Once widely used, it is no longer recommended for water disinfection Although a powerful oxidizing agent, it is not a satisfactory agent for disinfecting water. It may kill chole vibrios but very little action on other disease organisms. It alters the color, smell and taste of water.

C. **Filtration:** Water can be purified on a small scale by filtering through ceramics filters such as Paste Chamberland filter, Berkefeld filter and "Katadyn" filter. The essential part of a filter is the "candle" whic

is made up of porcelain in the Chamberland type and of kieselguhr or infusorial earth in the Berkefeld filter. In the Katadyn filter, the surface of the filter is coated with a silver catalyst so the bacteria coming in contact with the surface are killed by the "oligodynamic" action of the silver ions, which are liberated into the water. Filter candles of the fine type usually remove bacteria found in drinking water but not the filter-passing viruses. Filter candles are liable to be logged with impurities and bacteria.

D. **Ultraviolet irradiation:** Germicidal property of UV rays have been recognized for many years. UV irradiation is effective against most microorganisms known to contaminate water supplies like bacteria, yeast, viruses, fungi, algae, protozoa, etc.

E. **Multistage reverse osmosis purification of water:** Multistage reverse osmosis purification process is used to make water both chemically and microbiologically potable by reducing the total dissolved solids, hardness, heavy metals and disease causing bacteria, virus, protozoa and cysts.

Q14. Zoogleal layer. *(KIMS, 2021)*

Ans: In the slow sand filter, when the filter is newly laid, it acts merely as a mechanical strainer and cannot truly be considered as biological. But very soon, the surface of the sand bed gets covered with a slimy growth known as **"Schmutzdecke"**, vital layer, zoogleal layer or biological layer. This layer is slimy and gelatinous and consists of threadlike algae and numerous forms of life including plankton, diatoms and bacteria. The formation of vital layer is known as "ripening" of the filter. It may take several days for the vital layer to form fully, when fully formed it extends for 2 to 3 cm into the top portion of the sand bed. The vital layer is the heart of the slow sand filter. Until the vital layer is fully formed, the first few days filtrate is usually run to waste.

Functions: It removes organic matter, hold back bacteria and oxidizes ammoniacal nitrogen into nitrates and helps in yielding a bacteria free water.

CM3.2: Describe water quality standards.

Q15. Enumerate the criteria and standards of drinking water. Describe each aspect in brief. *(BNMUB, 2018; ABKUB, 2019)*/**Describe water quality standard.** *(NU, 2017)*/**Describe bacterial indicator of drinking water quality.** *(WBUHS, 2017; VKSUAB, 2018; SSUHSA, 2006; DU, 2014)*

Ans: Water quality – Criteria and standards:

The guidelines for drinking water quality recommended by WHO (2011) relate to following variables:

Types	*Variables*
I.	Acceptability aspects
II.	Microbiological aspects
III.	Chemical aspects
IV.	Radiological aspects

1. **Acceptability aspects:**

A. *Physical Parameters:*

Parameters	*Requirement (acceptable limit)*
Turbidity	On aesthetic grounds, drinking water should be free from turbidity. Turbidity in the drinking water is caused by particulate matter.
Color	Drinking water should be free from color which may be due to the presence of colored organic matter, metals such as iron and manganese, or colored industrial wastes.
Taste and odor	Taste and odor originate from natural and biological sources or processes, by contamination by chemicals, or as a by-product of water treatment (e.g., chlorination).
Temperature	Low water temperature tends to decrease the efficiency of a deleterious effect on drinking water quality.

B. *Inorganic constituents:*

Parameters	Requirement (acceptable limit)
Chlorides	All water including rain water contain chlorides.
Hardness	It may vary from one community to another, depending on local conditions.
Ammonia	Ammonia in the environment originates from metabolic, agricultural and industrial processes and from disinfection with chloramine
pH	One of the main objectives in controlling the pH is to minimize corrosion and incrustation in the distribution system. pH levels of less than 7 may cause severe corrosion of metals in the distribution pipes and elevated level of certain chemical substances, such as lead, may result. At pH levels above 8, there is a progressive decrease in the efficiency of the chlorine disinfection process. An acceptable pH drinking water is 6.5–8.5.
Hydrogen sulfide	The taste and odor threshold of hydrogen sulfide in water are estimated to be between 0.05 and 0.1 mg/L.
Iron	Anaerobic ground water may contain ferrous iron at concentrations of up to several mg/L without discoloration or turbidity in water when directly pumped from the well
Sodium	The taste threshold concentration of sodium in water depends on the associated anion and the temperature of the solution.
Sulfate	It is generally considered that the taste impairment is minimal below 25 mg/L.
Manganese	Manganese concentrations below 0.1 mg/L are usually acceptable to consumers. This may vary with local circumstances.
Copper	It increases the corrosion of galvanized iron and steel fittings.
Aluminum	The presence of aluminum at concentration in excess of 0.2 mg/L often leads to deposition of aluminum hydroxide floc in distribution system and the exacerbation of discoloration of water by iron.

2. **Microbiological aspects:**

A. *Bacteriological indicators:*

Parameters	Requirement (acceptable limit)
Coliform organisms	The coliform organisms include all aerobic and facultative anaerobic, gram-negative nonsporing, motile and nonmotile rods capable of fermenting lactose at 35–370°C in less than 48 hours. Typical example of fecal group is *E. coli* and nonfecal group, *Klebsiella aerogenes*. From a practical point of view, it is assumed that all coliforms are of fecal origin unless a nonfecal origin can be proved.
Fecal streptococci	Fecal streptococci regularly occur in feces but much smaller numbers than *E. coli*, in doubtful cases, presence of fecal streptococci in water is regarded as important confirmatory evidence of recent pollution of water.
Clostridium perfringens	They occurs regularly in feces though generally in much smaller numbers than *E. coli*. The spores are capable of surviving in water for longer time than organisms of coliform group. They usually resist chlorination at the doses normally used in water works practice. The presence of spores of *Cl. perfringens* in natural water suggests that fecal contamination has occurred and in the absence of coliform group, also suggests that the fecal contamination occurred at some remote time.

B. *Virological aspects:* It is recommended that acceptable drinking water should be free from any viruses. Disinfection with 0.5 mg/L of free chlorine residual after a contact period of at least 30 minutes at a pH of 8.0 is inactivate virus.

C. *Biological aspects:*

Parameters	Requirement (acceptable limit)
Protozoa	Species of protozoa known to have been transmitted by ingestion of contaminated drinking water include *E. histolytica, Giardia* and *Balantidium coli.*
Helminths	The infective form of round worm, thread worm can be transmitted to man through drinking water.
Free living organisms	It includes fungi, algae, etc.

3. **Chemical aspects:**

A. *Inorganic constituents:*

Parameters	Requirement (acceptable limit)
Arsenic	0.01 mg/Liter
Cadmium	0.003 mg/Liter
Chromium	0.05 mg/L
Fluoride	1.5 mg/L
Lead	0.01 mg/L
Mercury	0.006 mg/L
Nitrate and titrate	50 mg/L
Selenium	0.01 mg/L

B. *Organic constituents:*

Parameters	Requirement (acceptable limit)
Benzene	10 µg/L
Toluene	700 µg/L
Carbon tetrachloride	2 µg/L

4. **Radiological aspects:** Radioactivity in drinking water should not only be kept within safe limits; it should also, within those limits, be kept as low as is reasonably possible. From a radiological point to view, they represent a value below which water can be considered potable without any further radiological examination.

Q16a. **Discuss the different tests for bacteriological surveillance of drinking water.** *(WBUHS, 2013; GNSUB, 2022; RGUHS, 2013; BNMUB, 2023; AFUH, 2023)*/**Explain why coliform organisms are chosen as indicator of fecal pollution of water.** *(WBUHS, 2015; BNMUB, 2013; TDMGRMU, 2013; ABKUB, 2023)*

Ans: **Following tests are used for bacteriological surveillance:**

Presumptive coliform test: Multiple tube method—the test is based on estimating the most probable number of coliform organism at 100 mL of water. The test carried out by inoculating measured quantities of sample water (0.1, 1, 10, 50 mL) into tubes of McConkey's lactose bile salt broth with bromocresol purple as an indicator. The tubes are incubated for 48 hours. From the numbers of tube showing acid and gas, an estimate of MPN of coli form organisms in 100 mL of the sample water can be obtained from statistical tables. The result is known as "presumptive coliform count", the presumption being each tube showing fermentation, contains coliform organisms. The reaction may occasionally due to presence of some other organisms or combination of organisms.

Confirmatory tests: The next step is to confirm the presence of coliform organisms in each tube showing a presumptive positive reaction. Such confirmation is not generally required in case of unchlorinated water, but is required in case of chlorinated water. Confirmation is done by subculturing each presumptive positive tube in 2 tubes of brilliant green bile broth, one of which is incubated at 37°C for up to 48 hours confirmation

for confirmation of the presence of coliform organism and the other incubated at 44°C and inspected 6-24 hours to decide whether or not *E. coli* is present. *E. coli* is almost only the coliform organism which capable of producing gas from lactose at 44°C. Further confirmation of the presence of *E. coli*, if desired, be obtained by testing for indole production at 44°C.

Interpretation of results of disinfected water:

1. No coliform in 100 cc of water—excellent water
2. 1-2 coliforms in 100 cc of water—satisfactory water
3. 3-10 coliforms in 100 cc of water—suspicious water
4. More than 10 coliform in 100 cc of water—unsatisfactory water.

Membrane filtration technique: The measured volume of water is filtered through a membrane specially made of cellulose ester. All the bacteria present in water are retained on the surface of the membrane and by inoculating the membrane face upwards on suitable media and at appropriate temperature, it is possible to count the colonies and obtain results within 20 hours as compared to 72-96 hours required for the usual multiple tube technique.

Colony count: Colony counts on nutrient agar at 37°C and 22°C are frequently used in the bacteriological examination of water. Colony counts provide an estimate of general bacterial purity of water. A single count is of little value, but counts from the same source at frequent intervals may be of considerable value. A sudden increase in the colony count may give the earliest indication of contamination. The recommended plate count is described in the table.

Water at the point of consumption	*Plate count after 2 days at 37°C*	*Plate count after 3 days at 22°C*
Disinfected	0	20
Not-disinfected	10	100

Tests for presence of fecal streptococci and *Cl. perfringens*:

Detection of fecal streptococci: By using buffered azide glucose glycerol medium - multiple portions of water are inoculated into tubes containing buffered azide glucose glycerol broth and incubated at 45°C for 2 days.

Detection of Clostridium perfringens: *Clostridium perfringens*, being an anaerobic spore bearing organism the water is heated at 75°C for 10 minutes to destroy the nonspore bearing organism. It is then inoculated in differential reinforced clostridium (DRC) medium in a screw capped bottle and incubated at 37°C for 2 days.

Q16b. Coliform organisms are chosen as indicator of fecal pollution.

(WBUHS, 2015; BNMUB, 2013, 2023; TDMGRMU, 20

The coliform organisms include all aerobic and facultative anaerobic, gram-negative, nonsporing, motile and nonmotile rods capable of fermenting lactose at 35-37°C in less than 48 hours. The coliform group includes both fecal and nonfecal organisms. Typical example of fecal group is *E. coli* and nonfecal group, *Klebsiella aerogens*. From a practical point of view, it is assumed that all coliforms are of fecal origin unless a nonfecal origin can be proved. There are several reasons why coliform organisms are chosen as indicators of fecal pollution. Causes included are:

Causes	*Interpretations*
1.	The coliform organisms are present in great abundance in human intestine. It is estimated that an average person excretes 200-400 billion of these organisms per day.
2.	They are easily detected by culture methods. As small as one bacterium in 100 mL of water, whereas methods for detecting the pathogenic organisms are complicated and time-consuming.
3.	They survive longer than the pathogens, which tend to die out more rapidly than coliform bacilli.
4.	The coliform bacilli have greater resistance to the forces of natural purification than the waterborne pathogens

Q17. Name the important inorganic chemicals of health significance present in ground water of West Bengal. Describe in brief the health effects and control measures. *(WBUHS, 2017)*

Ans: The following inorganic chemicals are present in ground water:

- Arsenic
- Cadmium
- Chromium
- Cyanide
- Fluoride
- Lead
- Mercury
- Nitrate and titrate
- Selenium

Two important inorganic chemicals of health significance present in ground water of West Bengal are: (1) Arsenic and (2) Fluoride – a double edged sword. These are abundantly present in different blocks of few districts of West Bengal.

Health effects of arsenics: Arsenicosis, chronic arsenic toxicity, as a result of drinking arsenic-contaminated groundwater is a major environmental health hazard throughout the world, including India. Pigmentation and keratosis are the specific skin diseases characteristic of chronic arsenic toxicity. However, in West Bengal, it was found to produce various systemic manifestations, such as chronic lung disease, characterized by chronic bronchitis, chronic obstructive and/or restrictive pulmonary disease, and bronchiectasis; liver diseases, such as noncirrhotic portal fibrosis; polyneuropathy; peripheral vascular disease; hypertension; nonpitting edema of feet/hands; conjunctival congestion; weakness; and anemia.

Control measures: West Bengal, severely affected by arsenic in its groundwater, takes slow but steady steps to deal with it. Groundwater contamination by arsenic has been a major concern across the globe. In India, this highly toxic chemical exists in natural form in Uttar Pradesh, Bihar, Jharkhand, West Bengal and Assam. Exposure to it can cause discoloration of skin, warts and even death. Arsenic removal units (ARUs) are set up depending upon the level of arsenic and iron content in groundwater. ARUs last long and are most effective in removing arsenic from water. Water containing less than 50 parts per billion (ppb) arsenic and less than 1 milligram per liter iron, is considered safe and supplied without treatment. If arsenic and iron content exceed these limits, the water should be treated.

Many households have installed smaller and cheaper versions of ARU. Prof Arunava Majumdar gives the instance of a homegrown version of filter that uses bleaching powder and alum, which are easily available. Bleaching powder oxidizes arsenic and alum acts as the coagulating agent. Water is then passed through a sand filter that adsorbs any residual arsenic. The filter needs to be changed once every 3 years.

Another simple option is the single stage filter, developed by the department of sanitary engineering of All-India Institute of Hygiene and Public Health in Kolkata. When alum is mixed with water, it separates iron and arsenic from water. These are allowed to settle and the filtered water is ready to use.

Consequence of fluoride in groundwater: Fluoride accounts for about 0.3 g/kg of the earth's crust. Inorganic fluoride compounds are used in the production of aluminum and fluoride is released during manufacture and use of phosphate fertilizers which contain up to 4 percent fluorine. Level of daily exposure of fluoride depends on geographical area. If diets contain fish and tea exposure via food may be particularly high. Additional intake may result from the use of fluoride toothpastes.

Exposure to fluoride from drinking water depends greatly on natural circumstances. Level in raw water are normally below 1.5 mg/L but in ground water may contain about 10 mg/L in areas rich in fluoride-containing minerals.

Health effect: High fluoride level above 5 mg/L, are found in several countries (e.g., India, China, Thailand). Such high levels have at times led to **dental or skeletal fluorosis**. Soluble fluorosis are readily absorbed in the gastrointestinal tract after intake in drinking water.

Prevention and Control Measure:

A. **Changing the water source:** Find out new source of drinking water with fluoride content 0.5–0.8 mg/L if possible. Running surface water can be used and it contains lower quantities of fluorides than stagnant water.

B. **Chemical treatment (defluoridation):** National Environmental Engineering Research Institute, Nagpur developed a technique for removal of fluoride called **Nalgonda Technique**. Here two chemicals (lime and alum) are used in sequence followed by flocculation, sedimentation and filtration.

C. **Other measures:** In the area endemic for fluorosis, tooth paste containing fluoride not recommended for children up to 6 years of age.

Q18. Define hardness of water. What are the disadvantages of hardness of water? How will you purify water on large scale? *(WBUHS, 2019; BNMUB, 2016, 2017, 2018, 2019; SAMU, 2... RGUHS, 2024; RUJH, 20...*

Ans: Hardness of water: It may be defined as the soap destroying power of water. The consumer considers water hard if large amounts of soap are required to produce lather. The hardness in water is caused mainly by the dissolved compounds. These are:

1. Calcium bicarbonate
2. Magnesium bicarbonate
3. Calcium sulfate
4. Magnesium sulfate.

Hardness is classified as carbonate and noncarbonate. The carbonate hardness which was formerly designated as **"temporary"** hardness is due to the presence of calcium and magnesium bicarbonates. The noncarbonate hardness, formerly designated as **"permanent"** hardness is due to calcium and magnesium sulfates, chlorides and nitrates.

Disadvantages of hardness:

- Hardness in water consumes more soap and detergents.
- When hard water is heated, the carbonates are precipitated and bring about furring or scaling of boilers. This leads to great fuel consumption, loss of efficiency and may sometimes cause boiler explosions.
- Hard water adversely affects cooking: food cooked in soft water retains its natural color and appearance.
- Fabrics washed with soap in hard water do not have a long life.

Special treatment:

A. Removal of hardness: The removal methods of hardness are briefly stated as below:

Temporary hardness:

- Boiling
- Addition of lime
- Addition of sodium carbonate
- Base exchange process

Permanent hardness:

a. Addition of sodium carbonate
b. Base exchange process

Boiling: Boiling removes the temporary hardness by expelling carbon dioxide, and precipitating the insoluble calcium carbonate. It is an expensive process to soften water on large scale.

Addition of lime: Lime softening not only reduces total hardness but also accomplishes magnesium reduction. Lime absorbs the carbon dioxide and precipitates the insoluble calcium carbonate. In the Clark's

method of softening water one ounce of quick lime is added to every 700 gallons of water for each degree (14.25 ppm.) of hardness.

Addition of sodium carbonate: Sodium carbonate (soda ash) removes both temporary and permanent hardness.

Base exchange process: In the treatment of large water supplies, the permutit process is used. Sodium permutit is a complex compound of sodium, aluminum and silica (Na_2 Al_2 Si_2O H_2O). It has the property of exchanging the sodium cation for the calcium and magnesium ions in the water. When hard water is passed through the permutit the calcium and magnesium ions are entirely removed by base exchange and the sodium permutit is finally converted into calcium and magnesium permutit. By thus process water can be softened to zero hardness. Since water of zero hardness is corrosive, a part of the raw water is mixed with the softened water to secure the desired hardness. After permutit has been used for sometime, it loses its effectiveness but it may be regenerated by treating with concentrated solution of sodium chloride or brine and washing away the soluble calcium and magnesium chloride formed. Permutit process removes both temporary and permanent hardness.

CM3.2: Describe concepts of water conservation and rainwater harvesting.

Water conservation and harvesting in urban areas are done in following ways:

Water harvesting is extremely important to preserve and build-up underground water reserve in urban and semi-urban areas, where water is mostly drawn out by tube wells for domestic consumption. The vast quality of rainwater is normally discharged into drains. This rainwater can be easily added to the underground reserved by diversion of rainwater from rooftops and courtyards into soaking pits or trenches, instead of drains. Central Ground Water Board, UNICEF, etc., supporting for water harvesting to the state Government **(Fig. 3.4).**

The collected rainwater from rooftops is brought into the pit by PVC pipes. The rainwater filtered through these layers, then travels by a PVC pipe connecting bottom of the pit into the nearby well or tube well. The rainwater is used largely in Maharashtra.

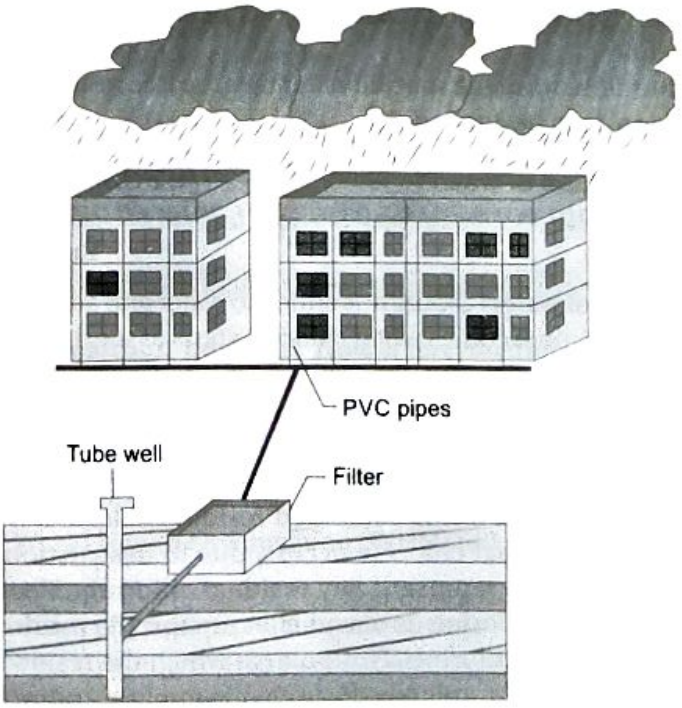


Fig. 3.4: Water harvesting.

Q19. Write down the principles of chlorination of water. *(WBUHS, 2013, 2022; MGUB, 2022; AI... ABKUB, 2023, 2024; BNMUB, 2013; RGUHS, 2014, 2024; SAMU, 2011; TDMGRMU, 2015; SSUH... SMU, 2013; MU, 2022; VNSGUS, 2023; KIMS, 2024)*/**Justify chlorination is an effective meth... water disinfection.** *(WBUHS, 2018)*/**The mere addition of chlorine to water is not chlorina...** *(WBUHS, 20...*

Ans: The mere addition of chlorine to water is not chlorination. There are certain rules which shou... obeyed in order to ensure proper chlorination.

It is one of the great advances in water purification. It oxidizes iron, manganese, hydrogen sulfide, d... some taste and odor producing substances, control algae and aids coagulation. Action of chlorine: disi... action of chlorine is due to **hypochlorous acid** and partly due to hypochlorite ions. Minimum recom... concentration of free residual chlorine is 0.5 mg/L.

$$H_2O + Cl_2 = HCl + HOCl$$
$$HOCL = H + Cl$$

Method of chlorination: For disinfecting large bodies of water, chlorine is applied either as: (a) Cl... gas, (b) Chloramines and (c) Perchloron.

Principles of chlorination: Followings are the principles of chlorination:

- The water to be chlorinated should be clear and free from turbidity. Turbidity impedes effi... chlorination.
- Chlorine demand of the water should be estimated. The chlorine demand of the water is the differ... between amount of the chlorine added to water and the amount of the chlorine remaining at the e... the specific period of contact at a given temperature and pH of the water. The point at which the chl... demand of the water is met is called the break point.
- The presence of residual chlorine for a contact period of at least 1 hour is essential to kill bacteria ... viruses. It should be noted however, that chlorine has no effect on spores, protozoal cysts and helmi... ova, except in higher doses.
- The minimum recommended concentration of free chlorine is 0.5 mg/L for 1 year. The free resi... chlorine provides a margin of safety against subsequent microbial concentration such as may occur du... storage and distribution.
- The sum of the chlorine demand of the specific water plus the free residual chlorine of 0.5 mg/L constit... the correct dose of chlorine to be applied.

Q20. What is breakpoint chlorination of water? *(WBUHS, 2023; ABKUB, 2018; BNMUB, 2... RGUHS, 2010, 2012; SAMU, 2016; SMU, 2011; MUHS, 2019; VNSGUS, 2023; TRIU, 20...*
Residual chlorination *(GOAU, 2...*

Ans: The breakpoint chlorination of water: Chlorine is added to water and addition of chlorine will form comp... with the organic compounds. A time comes when chlorine starts to stay in water as residual chlorine with... reaction with any organic compound due to its exhaustion. So here chlorine demand is met and free chlor... starts appearing in the water. This particular point when residual chlorine starts appearing in the wate... called breakpoint chlorination **(Fig. 3.5)**

The addition of chlorine to ammonia in water produces chloramines which do not have the sa... efficiency as free chlorine and these forms combined residual chlorine. If the chlorine dose of wate... increased, a reduction in the residual chlorine occurs, due to destruction of chloramine by the add... chlorine. The end products do not represent any residual chlorine. This fall in residual chlorine w... continue with further increase in chlorine dose and after a stage, the residual chlorine begins to increa... in proportion to the added dose of chlorine. This point at which the residual chlorine appears and wh... all combined chlorines have been completely destroyed is the breakpoint and corresponding dosage ... the breakpoint dosage.

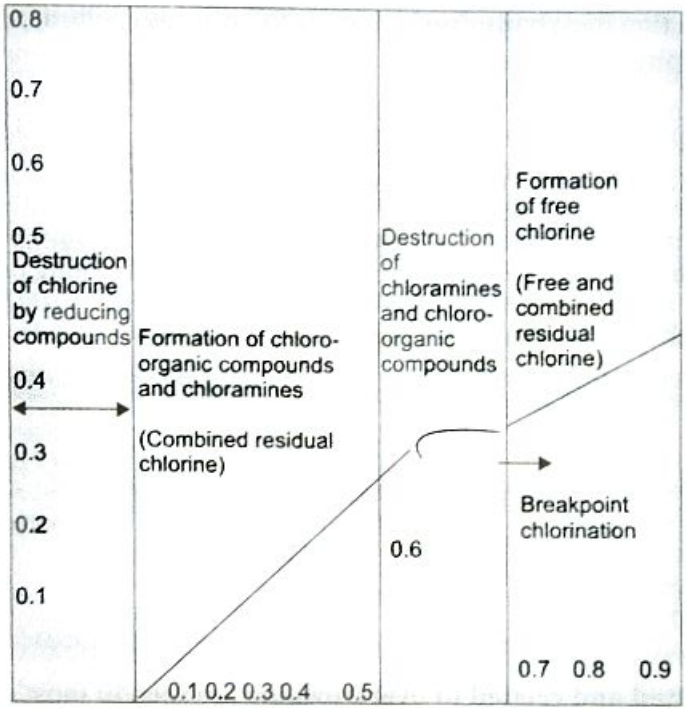


Fig. 3.5: Phases of breakpoint chlorination.

Q21. What is super chlorination? *(WBUHS, 2023; SSUHSA, 2013; TDMGRMU, 2014)*

Ans: Super chlorination is the process of chlorination, wherein double the usual dose of chlorine is added to water, so as to get free residual chlorine of more than 2 ppm at the end of contact period.

Indications:
- Heavily contaminated water
- Threatening outbreak of waterborne epidemic

Disadvantages:
- Smell of chlorine in water
- Water irritates throat, nose and eyes while drinking

Significance: Because of the disadvantages involved, super chlorination should be followed by dechlorination.

CM3.5: Describe the standards of housing and the effect of housing on health.

Q22a. What are the criteria for healthful housing? How overcrowding is detected? What are the diseases transmitted and related to overcrowding?/Overcrowding is a health hazard—Explain/Poor housing can have adverse effects on health—Explain. *(WBUHS, 2013, 2020, 2022; MGUB, 2022, 2023, 2024; BNMUB, 2011, 2022; VKSUAB, 2021; RGUHS, 2014, 2015; TRIU, 2014, 2016, 2023; SAMU, 2008; TDMGRMU, 2011, 2012; SSUHSA, 2007, 2013; AKUB, 2023; ABKUB, 2024)*

Ans: An expert committee of World Health Organization (WHO) recommended the following:

Criteria for healthful housing:
- Healthful housing provides physical protection and shelter.
- It provides adequately for cooking, eating, washing and excretory functions.
- It is designed, constructed, maintained and used in a manner such as to prevent the spread of communicable diseases.

- It provides for protection from hazards of exposure to noise and pollution.
- It is free from unsafe physical arrangements due to construction or maintenance, and from toxic or l... materials.
- It encourages personal and community development, promotes social relationships, reflects a r... ecological principles, and by these means promotes mental health.

Overcrowding refers to the situation in which more people are living with single dwelling than i... space for, so that movement is restricted, privacy secluded, hygiene impossible, rest and sleep dif... is significant problem in our country particularly in slum areas and among poor socioeconomic fa...

Q22b. Accepted standards with respect to overcrowding are as follows: *(SSUHS ...*

Person per room	Per capita floor space	Sex separation
1 room–2 persons	≥110 sq.ft—2 persons	Overcrowding is considered to e...
2 rooms–3 persons	90–100 sq.ft—1 ½ persons	if 2 persons over 9 years of age, no...
3 rooms–5 persons	70–90 sq. ft—1 person	husband and wife, of opposite sex a...
4 rooms–7 persons	50–70 sq.ft—½ person	obliged to sleep in the same room.
5 rooms–10 persons	Under 50 sq.ft—no person	
Add 2 for each further room		
<12 months—not counted 1–10 years-½ unit		

The **diseases transmitted and related to overcrowding** are seen in most of under-mentioned situ... *(SAMU, 2022)*

- **Respiratory infections** like common cold, tuberculosis, influenza, diphtheria, measles and whoo... cough.
- **GI infections** like diarrhea, cholera and hepatitis-A.
- **The effects on psychosocial health** like irritability, frustration, lack of sleep, anxiety, violence, m... disorders, etc. Children are more affected. In short, it is a psychosocial stress, leading to unhappiness... very probably to psychosomatic and mental disorders.

CM3.4: Describe the concept of solid waste, human excreta and sewage disposal.

Q22c. Describe the method of solid waste disposal *(KIMS 2...*

Concept of solid waste: The term "solid waste" includes garbage (food wastes), rubbish (paper, plas... wood, metal, throw-away containers, glass), demolition products (bricks, masonry, pipes), sewage treatm... residue (sludge and solids from the coarse screening of domestic sewage), dead animals, manure and o... discarded material. **Strictly speaking it should not contain nightsoil.**

Solid waste, if allowed to accumulate, it may cause following health hazard:

- It decomposes and favors fly breeding.
- It attracts rodents and vermin.
- It may cause water and soil pollution.
- Having an unmighty appearance may cause nuisance from bad odors.

Concept of human excreta: It contains disease producing organisms. It comes back to human body thro... mouth by contaminated water, dirty hands, flies, insects and eating raw and unwashed vegetables. S... ould be disposed of safely, nearly 29% of Indians defecated in open air.

...uman excreta disposal: Methods of human excreta disposal by use of sanitary latrines. It should f... following criteria:

- It should be acceptable, affordable and accessible.
- It does not contaminate source of water and free from flies.
- It does not produce objectionable odor.
- It should be clean.

Some of the commonly used latrines in rural and urban areas of India:

Bore hole latrine: It was first introduced by the Rockefeller Foundation during 1930s in the campaigns of hookworm control. The latrine consists of a circular hole 30 to 40 cm in diameter, dug vertically into the ground to a depth of 4 to 8 meter (average 20 ft). A special equipment known as auger is required to dig a bore hole. The excreta and used water directly fall into the hole and undergoes anaerobic digestion. The hole can be linked with bamboo matting or earthen ware rings to prevent caving in of the soil. A concrete squatting plate with a central opening and foot rests is placed over the hole, a suitable encloser is put up to provide privacy.

Dug well latrine or pit latrine: It was first introduced in Singur, West Bengal 1949–1950. An improved form of bore hole latrine. A circular pit about 75 cm in diameter and 3 to 3.5 meter deep is dug into the ground for reception of nightsoil (excreta). A concrete squatting plate is placed on the top of the pit and is enclosed with a super structure.

Advantages:

- It is easy to construct and no special equipment such as an auger is needed to dig the pit.
- The pit has a longer life than the bore hole because of greater cubic capacity.
- It can last for about 5 years for a family of 4–5 persons.

Disadvantages:

- Flies can come in contact with the excreta
- Objectionable odor

Two pits pour flash latrine:

Ventilated improved pit latrine: A vent pipe is added to the pit to help escape of gases and also remove bad smell. Fly screen is fitted at the top of vent pipe to act as trap for flies.

Flush type water seal latrine: A further improvement in designing of latrine in rural area is hand-flashed water seal type. A squatting plate is fitted with a water seal. It has two important functions:

1. It prevents access of flies due to water seal property.
2. It also prevents escape of odors and foul gases and thereby eliminates the nuisance from smell. Acceptable to rural people than bore hole or pit latrine.

Q23. What type of latrine you will recommend for a rural area?

(WBUHS, 2008; BNMUB, 2003; RGUHS, 2002)

Ans: The latrine should be recommended for a rural area is **"Two pits pour-flush latrine"** which is really a form of sanitary latrines. This is recommended for a family. This is not for community.

This type of latrine requires water for flushing usually hand (pour) flashed, require at least 2 liters of water after every use to wash the fecal matter into the pit though trap attached to it.

The essential feature of flush type is the "water seal" – this is the amount of water which remains in the trap and prevent entry of flies/fly breeding and bad odor.

Latrine pan is connected to two pits by Y shaped drain. Two pits of 1.5 meter deep and 1 meter diameter are dug and connected through pipes to pan. One pit is put to use at a time. One pit can last for 3 years for 5 persons.

Once the first pit is filled up in about 3 years, the second pit is then used. The excreta in the first pit is kept for 2 years, gets self-digested by soil bacteria anaerobically and is rendered harmless, can be used as manure. Hence, two pits are used alternately.

But in rural area no flush is there but water is poured into the pan by the user manually. In one of two pits, raw fecal matters are stored but in urban area it is stored in septic tank or passes to the sewerage system.

Thus, in respect of the philosophy of latrine, urban area is same as that of latrine recommended in rural areas. These latrines in rural areas are cheap and these are easily available. The price is subsidized for promotion of sanitary latrine under **Total Sanitation Campaign (TSC).**

So, this variety of two-pits manual (pour-flush) latrine will be recommended for rural area.

Two types of water seal latrine are popular and also tested in the field, viz:

1. PRAI (Planning, Research and Action Institute, Lucknow, Uttar Pradesh)
2. RCA type designed by Research-cum-Action projects in Environmental Sanitation, Ministry of ... GOI, All India Institute of Hygiene and Public Health, Kolkata. This type widely accepted in differe... of India.

The essential features of RCA latrine:

- Location
- Squatting plate
- Pan
- Trap
- Connecting pipe
- Dug well
- Superstructure

Example of different types of sanitary latrines: Bore-hole latrine, dug well latrine, water seal latrine ... type and RCA type. RCA type has been accepted more.

Q24. What are the criteria for a sanitary latrine? Discuss the principles of septic tank.

(WBUHS, 2008; BNMUB, 2002, 2003; GNSUB, 2022; RGUHS, 20...

Ans: A sanitary latrine should fulfill the following criteria:

- Excreta should not contaminate ground or surface water
- Excreta should not pollute the soil
- Excreta should not be accessible to flies, rodents, animals (pigs, dogs and cattle)
- Excreta should not create a nuisance due to odor or unsightly appearance.

Septic tanks are used in urban areas and by some well to do household in rural areas. 22% of urban ... 14.7% of rural households are using this type of latrine.

Features of septic tank:

The **Principles of Septic Tank** are:

- The solid matter settles down in the septic tank, to form "sludge", while the lighter solids including gre... and fat rise to the surface to form "scum".
- The solids are attacked by the anaerobic bacteria and fungi and are broken down into simpler chem... compounds. This stage of purification is anaerobic digestion. As a result of anaerobic digestion, slud... became reduced, stable and inoffensive. A proportion of solids is transferred into liquids and gas... (principally methane) which rise to the surface in the form of bubbles.
- The liquid which passes out of the outer pipe from time-to-time is called the "effluent". It contains numer... bacteria, cysts, helminthic ova and organic matter in solution or fine suspension. The effluent is allow... to percolate into subsoil. It is dispersed by means of perforated or open-jointed pipes laid in trenches ... cm (3 ft) deep and the trenches are then covered with soil. The effluent percolates into the surround... soil. It contains millions of aerobic bacteria in upper layers of the soil, which attack organic matter pres... in the effluent. Then, the organic matter is oxidized into stable end products like nitrates, carbon dioxi... and water. This stage of purification is called aerobic oxidation.
- To sum up, there are two stages of purification took place in sewage of septic tank viz., anaerobic digest... in septic tank proper, aerobic oxidation outside septic tank and in sub soil. **These two stages comple... the purification of sewage of septic tank.**

Concept of sewage disposal:

Sewage is a waste water from a community, containing solid and liquid excreta, derived from houses, sto... and yard washing, factories and industries. It resembles dirty water with an unpleasant smell.

Sewage contains 99% water, solid content is less than 1% which is partly organic and inorganic.

If it is not treated adequately, the raw or untreated sewage can cause following hazards.

- Creation of nuisance, unsightliness, unpleasant odors
- Breeding of flies and mosquitoes
- Pollution of soil and water supplies
- Increase in the incidence of diseases, especially enteric and helminthic diseases

Sewage treatment facilities are available in metropolitan and mega cities only. Other cities it is done through different types of sanitary latrines.

Modern sewage treatment: Modern sewage treatments are based on biological principles of sewage purification, where the purification is brought about by the action of aerobic and anaerobic bacteria. The treatment of sewage may be divided into two stages, primary treatment and secondary treatment.

In primary treatment, solids are separated from sewage partly by screening and partly by sedimentation and subjected to anaerobic digestion, which is the first stage of purification. Components of primary treatment are—screening, grit chamber and primary sedimentation.

In secondary treatment, the effluent is subjected to aerobic oxidation, which is the second stage in purification. Secondary treatment can be achieved through the Trickling filter method, Activated sludge process.

Q25a. Describe biological (biochemical) treatment of sewage. *(WBUHS, 2013)*/**What is biological (biochemical) oxygen demand (BOD).** *(WBUHS, 2021; MGUB, 2023)*

Ans: The aim of the sewage treatment is to stabilize the organic matter so that it can be disposed off slowly and to convert the sewage water into an acceptable standard of purity which can be disposed off into land, river, and sea. A standard test which is an indicator of organic content of the sewage is biochemical oxygen demand **(BOD).**

The strength of the sewage is expressed in terms of BOD:

Biological Oxygen Demand (BOD): It is the most important test done on sewage. It is defined as the amount of oxygen absorbed by a sample of sewage during a specified period, generally 5 days, at a specific temperature, generally 20°C for the aerobic destruction or use of organic matter by living organisms. BOD values range from about 1 mg per liter for natural water to about 300 mg per liter for untreated domestic sewage. If the BOD is 300 mg/L and above, the sewage is said to be strong, if it is 100 mg/L, it is said to be weak.

Other methods are chemical oxygen demand (COD) and suspended solids.

Q25b. What is soakage pit/disposal of wastewater at household level? *(RGUHS, 2007, 2008; TDMGRMU, 2009, 2010)*

Ans: The term **"sullage"** is applied to the waste water which does not contain human excreta, e.g., wastewater from kitchen and bathrooms. **Soakage pit** is a cheap simple, sanitary method of disposing sullage water in rural set up.

Steps in constructing a Soakage pit:

- Choose a proper site which should be at least 10 m distant from house well and any well. Moreover, at the chosen site the water level should be more than 3-4 m below the ground level.
- Dig a pit about 1 m long, broad and deep with a 15 cm slope at the bottom directed away from house.
- Divide the depth of the pit into roughly four equal parts. Fill the lower part with stones or bricks, the size of a coconut. Fill the second part with stones or bricks, the size of a big apple.

Q26. Describe sanitary barrier and its public health importance. *(WBUHS, 2008, 2011, 2018; AKUB, 2022; ABKUB, 2021; BNMUB, 2004; GNSUB, 2022; RGUHS, 2008, 2015; TRIU, 2014, 2016, 2020; SAMU, 2008, 2015; TDMGRMU, 2011, 2012; SSUHSA, 2007, 2010, 2023; SMU, 2013, 2014; NU, 2016; MU, 2019; MUHS, 2019; SDVPG, 2023; VNSGUS, 2023)*

Ans: **Sanitary barrier** is very useful strategy for prevention of fecal-borne diseases. Human excreta ... various types of disease agents, which are transmitted to new host through various channels. These channels are well-known. These are multiple Fs **(Fig. 3.6)**.

Sanitary barrier aims at breaking the disease cycles at vulnerable points. The disease cycle may be broken at various levels. (a) Segregation of feces, (b) Protection of water supply, (c) Protection of foods, (d) Personal hygiene and (e) Control of flies. Of these, most effective step would be to segregate the feces and arrange for proper disposal, so that the disease agent cannot reach the new host, directly or indirectly.

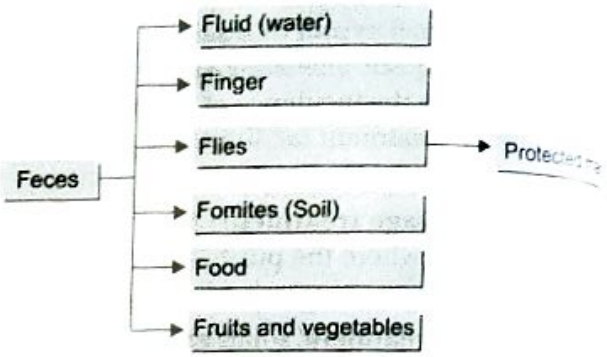


Fig. 3.6: Sanitary barrier.

Q27. What is sanitary landfill? *(WBUHS, 2011; TDMGRMU, 2010; MGUB ...*

Ans: **Sanitary landfill** is the most satisfactory method of refuse disposal, where suitable land is available. Th... methods are used in operation—trench method, ramp method, area method.

Trench method: Where level ground is available, the trench method is usually chosen. A long trenc... dug out 6-10 feet deep and 12-36 feet wide, depending upon local condition. The refuse is compacted ... covered with excavated earth.

Ramp method: This method is usually suited, where the terrain is moderately sloping.

Area method: This method is used for filling land depression, disused quarries and clay pits. E... layer is sealed on its exposed surface with a mud cover of at least 30 cm thick. Such sealing preve... the infestation by flies and rodents and suppresses the nuisance of smell and dust. Chemi... bacteriological and physical changes occur in buried refuse. The temperature rises to over 6... within 7 days and kills the pathogen and hastens decomposition process. Then it takes 2-3 wee... to cool down. Normally it takes 4-6 months for complete decomposition of organic matter into ... innocuous mass. The tipping of refuse in water should not be done as it creates a nuisance fr... odors given off by the decomposition of organic matter. The method of controlled tipping has be... revolutionized by mechanization.

CM3.1: Describe the health hazards of air pollution.

Q28. What are the causes of air pollution and health hazards (effect on human health) and prevention and control? *(WBUHS, 2019, 2022, 2023; ABKUB, 2018; AKUB, 2022; VKSUAB, 2021; YSRUHSAP 2... SSUHSA, 2011, 2017; DU, 2015, 2013; SMU, 2011, 2012; NIMSUR, 2015; NU, 2013, 2... MU, 2019; MUHS, 2019; GOAU, 2021; AKUB, 2024; VNSGUS, 2023; KIMS, 20...*

Ans: Air pollution signifies the presence of ambient (surrounding) atmosphere of substances (gases, mixtur... of gases and particulate matter) generated by human activities in a concentration that interfere w... human health, safety and comfort or injurious to vegetation and animals and other environmen... media.

...urces of air pollution:

- **...utomobiles:** Motor vehicles are a major source of air pollution throughout the urban areas. They e... ...ydrocarbons, carbon monoxide, lead, nitrogen oxides and particulate matter.
- **Industries:** Industries emit large amounts of pollutants into the atmosphere. Combustion of fuel generat... heat and power produces smoke, sulfur dioxide, nitrogen oxides and fly ash. Petrochemical industr... generate hydrogen fluoride, hydrochloric acid and organic halides. Many industries discharge carb... monoxide, carbon dioxide, ozone, hydrogen sulfide and sulfur dioxide.

- **Domestic:** Domestic combustion of coal, wood or oil is a major source of smoke, dust, sulfur dioxide and nitrogen oxides.
- **Miscellaneous:** Comprises of burning refuse, incinerators, wind borne dust, fungi, bacteria and from nuclear energy.

Health Effect of Air Pollution. *(AKUB, 2022; SSUHSA, 2022)*

Immediate effect:

- Acute bronchitis
- Immediate death by suffocation

Delayed effect:

- Chronic bronchitis
- Lung cancer
- Bronchial asthma
- Emphysema
- Respiratory allergies

Monitoring/Indicators of air pollution. *(GNSUB, 2022; BNMUB, 2013, RUJH, 2022; AKUB, 2023)*

The best of air pollution are the concentrations of sulfur dioxide, smoke and suspended particles present in air. These are monitored on a daily basis over several sites. The results are then collected by central agency.

Indicators are described in brief. *(KIMS, 2021; SSUHSA, 2024; VNSGUS, 2023; TRIU, 2023; ABKUB, 2023)*

- **Sulfur dioxide:** The gas is a major contaminant in many urban and industrial areas. Its concentration is estimated in all air pollution surveys.
- **Smoke or soiling index:** A known volume of air is filtered through a white paper under specific condition, stain is measured by photoelectric meter. Smoke concentration is estimated, expressed as micrograms/cubic meter of air as an average level over a period of time.
- **Grit and dust measurement:** These are analyzed monthly.
- **Co-efficient of haze:** A factor which is used particularly in the USA in assessing the amount of smoke or aerosol in air is very important.
- **Air pollution index**: It is an arbitrary index, which takes into account one or more pollutants as a measure of the severity of the pollution.

Parameter of Air Pollution *(ABKUB, 2005)*

- Particle pollution (particulate matter)
- Ground level ozone
- Carbon monoxide
- Sulfur dioxide
- Nitrogen oxides
- Lead

Prevention and control of air pollution: WHO recommended the following procedures for prevention and control of air pollution:

- **Containments:** It can be achieved by a variety of engineering methods such as enclosure, ventilation, air cleaning.
- **Replacement:** Increased use of electricity, solar power generation, natural gas and central heating in place of coal. In India, deleaded petrol is being used.
- **Dilution:** Some air pollutants are readily removed by vegetation. The establishment of green belt between industries and residential areas in an attempt at dilution.
- **Legislation:** Air pollution is controlled in many countries by suitable legislation, e.g., Clean Air Acts, legislation matters as height of chimneys, powers to local authorities to carry out investigations, research and creation of smokeless zones.
- **International cooperation:** To deal with air pollution on a world-wide scale, the WHO has established an international network of laboratories for the monitoring and study of air pollution.

Q28a. What is smog? The AQI of your city is falling within the range of 200–300 during the last 7 days in month of March. What is the health effect of the above situation? What measures can be adopted tackle that situation? *(WBUH*

Q28b. What is National Air Quality Index (AQI)? *(SDV P*

Ans: Smog: The term is derived from two letters smoke and fog. It is a complex mixture of air pollutants a vapor.

The National Air Quality Index (NAQI) was launched in New Delhi on September 17, 2014, under the Bharat Abhiyan.

The Central Pollution Control Board along with State Pollution Control Boards has been op National Air Monitoring Program (NAMP) covering 240 cities of the country having more than 342 mon stations. An Expert Group comprising medical professionals, air quality experts, academia, advocacy g and SPCBs was constituted and a technical study was awarded to IIT Kanpur.

There are six AQI categories, namely Good, Satisfactory, Moderate, Poor, Severe and Hazardou

AQI vs Health Impacts

AQI	*Associated health impact*	*Color*
Good (0–50)	Minimal impact	Deep gre
Satisfactory (51–100)	May cause minor breathing discomfort to sensitive people	Light gre
Moderate (101–200)	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults	Yellow
Poor (201–300)	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease	Orange
Very Poor (301–400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases	Red
Severe (401–500)	May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity	Maroon

Health effects due to air pollution—Ans from Q28

Prevention and control—Ans from Q28

CM3.1: Describe the health hazards of noise pollution.

Q29. Describe noise. *(BNMUB, 2016)*/**Hazard of noise pollution (Exposure/Effect).**
(WBUHS, 2011, 2016, 2021; TRIU, 2021; TDMGRMU, 2012 2
SSUHSA, 2015, 2018, 2022, 2023, 2024; BNMUB, 2018, 2019; PBDSUHSH 2
MGUB, 2023; RUJH, 2023; VBUJH, 2023; KIMS, 2023; VNSGUS 2

Ans: Noise is often defined as "**unwanted sound**". Better definition is **"wrong sound, wrong place, wrong tim**
The loudness of noise is measured in decibels (dB).

Normal conservation procedure produces a noise of 60–65 dB, whispering, 20–30 dB, heavy, street tra 0–80 dB, boiler factories about 120 dB.

A daily exposure up to 85 dB is about the limit people can tolerate without substantial damage to the hearing. Hazards of noise pollution are of two types—auditory and nonauditory.

Auditory effects:

- **Auditory fatigue:** It appears in the 90 dB region and greatest at 4,000 Hz. It may be associated with the side effects like whistling and buzzing in the airs.
- **Deafness (Noise Induced Hearing Loss)** *(RGUHS, 2001, 2009; SAMU, 2011)*: The victim is generally unaware of the early stages. The hearing loss may be temporary or permanent. Temporary hearing loss results from a specific exposure to noise and disability disappears after a period of time up to 24 hours following the noise exposure. Most temporary hearing loss occurs in frequency range from 4,000 to 6,000 Hz. Repeated or continuous exposure to noise around 100 decibels may result in permanent hearing loss. Exposure to noise above 160 dB may cause rupture of tympanic membrane and cause permanent hearing loss.

Nonauditory effect: *(TDMGRMU, 2012, 2015)*

- **Interference with speech:** Noise interferes with speech communication. In everyday life, the frequencies causing most disturbances to speech communication lie in the 300–500 Hz range. For good speech intelligibility, it is considered that speech sound level must exceed the speech interference level by approximately 12 dB.
- **Annoyance:** Workmen exposed to higher intensity of noise in occupational capacities were often irritated, short-tempered and impatient.
- **Efficiency**: When mental concentration is to be undertaken, a low level of noise is also desired. Increase of the noise decrease efficiency.
- **Physiological changes:** A number of temporary physiological changes in the human body like rise of blood pressure, rise in the intracranial pressure, increase in the heart rate and breathing, increase in the sweating, narrowing of pupil, affect color vision, impair night vision.

Control of noise:

1. Careful planning of cities
2. Control of vehicles
3. To improve acoustic insulation of building
4. Industries and Railways—control of noise at source
5. Protection of exposed person
6. Legislation
7. Health education

CM3.1: Describe the health hazards of radiation pollution.

Q30a. Describe hazards of radiation. *(WBUHS, 2015, 2020, 2022; RGUHS, 2012, 2014; ABKUB, 2010; SAMU, 2022; TRIU, 2011; KIMS, 2015; SSUHSA, 2007, 2012)*

Ans: A number of industries use radium and other radioactive substances, e.g., painting of luminous dials for watches and other instruments, manufacture of radioactive paints. Exposure to radium also occurs in mining of radioactive ores, monazite sand workers and handling its ore products. X-rays are used both in medicine and industry. Exposure to ultraviolet rays occurs in arc and other electric welding processes. Infrared rays are produced in welding, glass blowing, foundry work and other processes where metal and glass are heated to the molten state and in heating and drying of painted and lacquered objects.

Q30b. Health effect of radiation. *(WBUHS, 2022; AKUB, 2022; KIMS, 2023)*

Ans: Occupational hazards due to ionizing radiation may be acute burns, dermatitis and blood dyscrasias. Chronic exposure may cause malignancies and genetic effects. Lung cancer may develop in miners working in uranium mines due to inhalation of radioactive dust. Biological hazards of radiation can be somatic and genetic in origin

Somatic Effects are of two types, immediate and delayed

Immediate: Radiation sickness and acute radiation syndrome.

Delayed: Leukemia, carcinogenesis, fetal developmental abnormalities and shortening of life.

Genetic: Chromosomal mutations and point mutations.

Q30c. Describe preventive measures (Radiation hygiene). *(BNMU)*

Ans: a. Inhalation, swallowing or direct contact with skin should be avoided.
b. X-ray shield should be used of such thickness and of such material which can reduce the exposure allowable limit.
c. The employees should be monitored at 6 months interval by using film badge or pocket electrometer.
d. Suitable protective clothing to prevent contact with harmful material should be used.
e. Adequate ventilation of workplace is necessary to prevent inhalation of harmful gases and dust.
f. Replacement and periodic examination of workers should be done every 2 months. If harmful effect substitution done.
g. Pregnant women should not be allowed to work in places where there is continuous exposure.

CM3.6: Describe the role of vectors in the causation of diseases.

Q31. Mention the different modes of vector borne disease transmission with examples.
(BNMUB, 2013; AKUB 2

Ans: The different modes of vector borne disease transmission with examples:

A. By transmission chain: Vector-borne diseases are classified under heterogeneous infection chain involve three principal patterns:

- *Man and nonvertebrate host:*
  - Man-arthropod-man (Malaria)
  - Man-snail-man (Schistosomiasis)
- *Man, another vertebrate host and a nonvertebrate host:*
  - Mammal-arthropod-man (Plague)
  - Bird-arthropod-man (Encephalitis)
- *Man and 2 intermediate host:*
  - Man-cyclops-fish-man (Fish tape worm)
  - Man-snail-fish-man (Clonorchis sinensis)
  - Man-snail-crab-man (Paragonimiasis)

B. By methods in which vectors transmit agent:

- *Biting:* Mosquitoes
- *Regurgitation:* House flies
- *Scratching in of infective feces:* House flies
- *Contamination of host with body fluids of vector:* House flies

C. By methods in vectors are involved in transmission and propagation of parasites:

- *Mechanical transmission:* The infectious agent is mechanically transported by a crawling of fly arthropod through soiling of its feet or proboscis or by passage of organisms through its gastrointestinal tract and passively excreted. There is no development of multiplication of the infectious agent within the vector.
- *Biological transmission:* Biological transmission is an example of indirect transmission. The infectious agent undergoing replication or development or both in vector and requires an incubation period before vectors can transmit. Biological transmissions are of three types:
  1. Propagative: Agent merely multiplies in vector, but no change in form, e.g., plague bacilli in rat flea
  2. Cyclo-propagative: The agent changes in form and number, e.g., is malaria parasite in mosquito
  3. Cyclo-developmental: The disease agent undergoes only development, but no multiplication e.g. Microfilaria in mosquitoes.

CM3.6: Describe National Vector Borne disease control program (Malaria, Filariasis, Japanese encephalitis, Dengue, Chikungunya fever and Kala-azar).

Q32. Enumerate the diseases of Public Health importance are included in the National Vector Borne Disease Control Program. *(NVBDCP)* **Describe the principle of vector control program according to existing National Program.** *(WBUHS, 2012, 2018; ABKUB, 2009, 2019; BNMUB, 2013; VKSUAB, 2018; NU, 2010, 2013; KIMS, 2013; SSUHSA ,2010; TRIU, 2013, 2016, 2023; RGUHS, 2024; VNSGUS, 2023)*

Ans: The diseases of Public Health importance and vectors are included in the National Vector Borne Disease Control Program (NVBDCP) are enumerated below.

Sl. No.	Diseases	Vectors
1.	Malaria	*Anopheles fluviatilis, Anopheles stephensi*
2.	Filaria	*Culex quinquefasciatus (Culex fatigans)*
3.	Japanese encephalitis	*Culex tritaeniorhynchus, Culex vishnui*
4.	Dengue	*Aedes aegypti, Aedes albopictus*
5.	Chikungunya	*Aedes aegypti*
6.	Kala-azar	*Phlebotomus argentipes*

The Principle of Vector Control Program according to NVBDCP:

- Disease management including early case detection and complete treatment
- Strengthening referral services
- Epidemic preparedness and rapid response
- Integrated vector management
- Supportive interventions like health education and community participation, behavior change communication (BCC), training of health personnel, intersectoral co-ordination and operational research and applied field research.

Q33. Discuss in brief the strategies under National Vector Borne Diseases Control Program *(NVBDCP)* **for prevention and control of vector borne diseases.** *(WBUHS, 2015; BNMUB, 2014; SMU, 2010; GNSUB, 2023)*

Q33a. Three-pronged strategy plays an important role in NVBDCP. *(WBUHS, 2023)*

Ans: Three important strategies of integrated vector management under National Vector Borne Diseases Control Program (NVBDCP) are as follows:

1. Disease management including early case detection and complete treatment, strengthening referral services, epidemic preparedness and rapid response
2. Integrated vector management
3. Supportive interventions such as behavior change communication (BCC), inter-sectoral convergence, public private partnership, operational research, monitoring and evaluation.

Q34. Write down the general guidelines for treatment of uncomplicated malaria as per national drug policy on March 2013. *(WBUHS, 2015; BNMUB, 2013, 2014; TRIU, 2016;2023; GITAMAP, 2023; MU, 2019)*

Q34a. Anti-malaria drug policy for uncomplicated Pf in North-East India. *(TRIU, 2024)*

Ans: General guidelines for treatment of uncomplicated malaria as per National Drug Policy can be summarized as follows:

A. **Microscopy or Rapid Diagnostic Kit (RDK):** All fever cases should be suspected of malaria after ruling out other common causes and should be investigated for confirmation of malaria by Microscopy or Rapid Diagnostic Kit (RDK) to ensure treatment with full therapeutic dose with appropriate drug to all confirmed cases.

B. **Drug Policy 2013:** The malaria case management is very important for prevention of serious ... death due to malaria. The private healthcare providers should also follow the common National ... for treatment of malaria as per the Drug Policy 2013.

C. ***P. vivax* treatment:** *P. vivax* cases should be treated with chloroquine for 3 days and Prima... 14 days. Primaquine is used to prevent relapse but is contraindicated in pregnant women, in... individuals with G6PD deficiency.

Note: Patients should be instructed to report back in case of hematuria or high colored urine ... blue coloration of lips and Primaquine should be stopped in such cases. Care should be taken in ... with anemia.

D. ***P. falciparum* Treatment:** *P. falciparum* cases should be treated with ACT (Artesunate ... Sulfadoxine-Pyrimethamine 1 day). This is to be accompanied by single dose primaquine prefe... days 2.

E. **North Eastern States treatment**: In North Eastern States, the Technical Advisory Commit... recommended to use the co-formulated tablet of Artemether (20 mg)—Lumefantrine (120 mg ... **AL)** as per the age-specific dose schedule for the treatment of *P. falciparum* cases in North ... States considering the reports of resistance to SP (Sulfadoxine-Pyrimethamine). This treatme... **recommended during the first trimester of pregnancy and for children weighing <5 kg.**

F. **Banning of drugs:** Production and sale of Artemisinin monotherapy has been banned in India. The ... should be referred to public health care center for comprehensive management.

G. **Treatment of pregnant women:** Pregnant women with uncomplicated *P. falciparum* should be tr... as follows: 1st Trimester: **Quinine**, 2nd and 3rd Trimester: **ACT**. Note: Primaquine is contraindic... pregnant woman.

H. **Treatment of suspected malaria:** In cases where parasitological diagnosis is not possible due t... availability of either timely microscopy or RDT, suspected malaria cases will be treated with full ... of chloroquine, till the results of microscopy are received. Once the parasitological diagnosis is ava... appropriate treatment as per the species, is to be administered.

I. **No presumptive treatment:** Presumptive treatment with chloroquine is no more recommended.

J. **Resistance:** Resistance should be suspected if in spite of full treatment with no history of vom... diarrhea, patient does not respond within 72 hours, clinically and parasitologically. Such cases ... responding to ACT, should be treated with oral quinine with Tetracycline/Doxycycline. These insta... should be reported to concerned District Malaria/State Malaria Officer/ROHFW for initiati... therapeutic efficacy studies.

These are general guidelines for treatment of uncomplicated malaria.

Q35a. Describe in brief the National Drug Policy 2014 on Malaria. *(WBUHS, 2018; VKSUAB, 2019; KIMS ... SSUHSA, 2010; TRIU, 2016)*/ **Diagnosis and treatment strategies of malaria as per National Strate... Plan [2017-22].** *(MGUB, 2022, 2024; ABKUB, 2022; TRIU, 2020; VNSGUS ...*

Ans: National Drug Policy on Malaria was first adopted in 1982 and the revised Policy (2013) has been dra... keeping in view the availability of more effective anti-malarial drugs and drug resistance status in ... country. Afterwards, National Strategic Plan (NSP) on Malaria Elimination in India (2017-2022) are be... implemented.

The strategies for achieving the goal and objectives of NSP is divided into the following four compone... based on

WHO recommended principles and pillars adopted in India:

A. Diagnosis and case management

B. Surveillance and epidemic response

C. Prevention-Integrated Vector Management (IVM)

D. **Other interventions:** Advocacy, communication and community mobilization, program manageme... and coordination, monitoring and evaluation, and research and development

Diagnosis of malaria as per National Strategic Plan (2017–22):

- Clinical diagnosis of malaria has poor accuracy and result in inappropriate management of febrile illness. Most common symptoms are fever, malaise, weakness, nausea, vomiting, diarrhea, headache, back pain, myalgia, chills and/or cough. Sometimes neurologic complaints like dizziness, confusion, disorientation and coma.
- Malaria is a common illness in the endemic areas, any febrile person suspected as malaria, in nonendemic area if history of previous travel to an area with known malaria transmission.
- Presumptive treatment is not routinely recommended.
- Microscopic examination of thick and thin blood smears is the **"Gold Standard"** but both *P. falciparum/P. vivax (Pf/Pv)* antigen detecting bivalent RDTs as well as microscopy are recommended by NVBDCP for parasitological confirmation. Microscopic examination is recommended at institutional level, i.e., PHCs/CHCs/District hospitals, etc., and **it will cover 30% of all fever cases.**
- Thick blood smears are more sensitive for malaria parasite detection and thin smears aid in parasite species identification. Positive slides should be read for parasite species, parasite stage and estimation of parasite density. Cross checking of **all positive slides and 5% of the negative slides** under Quality Assured Malaria Microscopy **(QAMM)**.
- Nonimmune individuals can present with symptoms of malaria at a very low parasite density that may initially be undetectable by microscopic examination of blood smears hence, should be repeated every 12–24 hours for a total of three sets, if all three sets of slides are negative, the diagnosis of malaria can be essentially be ruled out.
- RDTs are recommended at community level, especially in hard to reach and remote areas of the country where microscopy services are **not** available, to ensure early diagnosis and treatment initiation within 24 hours.
- Many ASHAs/HWs prepare blood slides and send them for malaria microscopy which fail to provide prompt results within 24 hours due to various reasons. All institutions should use RDTs for early diagnosis.
- Current focus of malaria diagnosis in India limited to diagnosis of Pf/Pv only. Some areas of **Madhya Pradesh and Chhattisgarh**, *P. malariae* and *P. ovale* cases have been reported. So laboratory technicians should also be trained on identification of those species as well as research institutions should aim to develop point of care diagnostic tests for *P. malariae* and *P. ovale*.

Q35b. Treatment (case management) strategies of malaria as per National Strategic Plan [2017–22]

(MGUB, 2024)

Ans:

- Early detection and complete treatment is the policy for case management.
- Presumptive treatment is not recommended and should be reserved for extreme circumstances only, when there is a strong clinical suspicion accompanied by severe disease and prompt microscopy or RDT is not possible.
- After diagnosis, appropriate antimalarial treatment must be initiated to ensure radical cure.

Treatment and selection of antimalarial drugs should be as per updated and latest National Malaria Drug Policy. Treatment cards should be maintained for all malaria patients and based on three main factors:

1. The infecting malaria parasite species
2. Clinical status of the patient
3. Drug susceptibility of the infecting parasites as determined by geographic area where the infection was acquired and previous use of antimalarial medicines.
   - Patient diagnosed with malaria are either uncomplicated or severe malaria. Uncomplicated malaria can be treated with oral antimalarials but patients having one or more complications should be immediately referred to an appropriate hospital and 1st dose should be administered urgently.
   - Diagnosis and case management of uncomplicated and severe malaria at public sector health facilities is free of cost.

- Artemisinin-based combination therapy–Artemether lumefantrine **(ACT-AL)** is the first line d... treatment of uncomplicated *P. falciparum* as per revised guidelines in the entire country.
- Artesunate/Quinine injection is the drug of choice for treatment of severe malaria, followed by co... oral dose of ACT.
- *P. falciparum* infection can cause rapidly progressive severe illness or death. So, urgent initiat... treatment is very important
- In *P. vivax* infections, patients having recovered from the first episode of illness may suffer addi... attacks(relapses) after months or even years with or without symptoms. Radical treatment is impor... to reduce the chance of such relapses and administered effectively under supervision for co... compliance after the first attack.
- Quinine remains the treatment of choice for pregnant mothers during 1st trimester of pregn... children under 5 kg body weight and for treatment failure cases.
- Chloroquine remains drug of choice for treatment of uncomplicated *P. vivax* malaria
- Treatment of severe *P. vivax* malaria is similar to treatment of *P. falciparum*.
- Mixed infection (Pv and Pf) should be treated as a case of Pf and treated with ACT and 14 days rad... treatment as prescribed for Pv cases.

Surveillance and epidemic response: Surveillance is recognized as a core intervention for mala... elimination. It should be enhanced so that aggregated data sent from peripheral level to higher level (he... facility to district to state to national level).

Outbreak preparedness and response: NVBDCP, in collaboration with National Centre for Disease Co... (NCDC) and other stakeholders would develop standard operation procedure for outbreak identifica... alert mechanism and response activities. NVBDCP will collaborate with IDSP working at district, state l... for quick investigation and response.

Integrated Vector Management (IVM)—Q.52

Q36. National Malaria Control Program (NMCP)/Discuss the reasons of persistence of Malar... *(BNMUB, 2005; SMU, 20...*

Ans: In the year 1953, Government of India launched a National Malaria Control Program (NMCP) with the follow... objectives to bring down malaria transmission at a level which it ceases to be a major public health proble...

Good results were obtained from India. Number of malaria cases and deaths had decreased significa... Similar results were obtained in many other parts of the world.

Considering the good result and recommendation in 8th World Health Assembly, India launch... National Eradication Program (NLEP) in 1958 with the objective to eradicate malaria by 7–9 years. The... was a spectacular reduction in cases and nil death was reported in 1965. Thereafter the program suffe... setbacks due to various constrains mainly financial, logistic, administrative and technical. This result... resurgence of malaria during 1970 with a view that urban areas have not received special attention. In 19... urban malaria scheme (UMS) was launched and anti-larval measure were undertaken but , there were hi... number of cases were recorded in 1976.

In 1977, Malaria eradication was given up and **modified plan of operation (MPO)** was adopted. Area w... divided on the basis of API (Annual Parasite Incidence) into, API ≥ 2 and API < 2.

MPO was able to control the malaria deaths at lower level but 1994 onwards, resurgence of malar... was observed in some states with epidemics and increase in mortality. These outbreaks are reported fro... Rajasthan, Manipur, Nagaland, Assam, Maharashtra, West Bengal and Haryana. Afterwards Malaria actio... program was formulated in 1994. Problem areas were identified like Tribal area, Epidemic prone area, Proje... area, triple insecticide resistance area and urban areas. Enhanced malaria control project in 1997 sponsor... by World Bank intensified in Tribal population and different States.

National Malaria Control Program has been renamed as "National Malaria Eradication Program" and further... renamed as "National Anti-Malaria Program" in 1999. But it has become the part of National Vector Borne... Disease Control Program (NVBDCP) under the umbrella of National Rural Health Mission (NRHM) in 2005...

- Artemisinin-based combination therapy-Artemether lumefantrine **(ACT-AL)** is the first line drug for treatment of uncomplicated *P. falciparum* as per revised guidelines in the entire country.
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- *P. falciparum* infection can cause rapidly progressive severe illness or death. So, urgent initiation of treatment is very important
- In *P. vivax* infections, patients having recovered from the first episode of illness may suffer additional attacks(relapses) after months or even years with or without symptoms. Radical treatment is important to reduce the chance of such relapses and administered effectively under supervision for complete compliance after the first attack.
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Integrated Vector Management (IVM)—Q.52

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Considering the good result and recommendation in 8th World Health Assembly, India launched National Eradication Program (NLEP) in 1958 with the objective to eradicate malaria by 7–9 years. There was a spectacular reduction in cases and nil death was reported in 1965. Thereafter the program suffered setbacks due to various constrains mainly financial, logistic, administrative and technical. This resulted resurgence of malaria during 1970 with a view that urban areas have not received special attention. In 1971, urban malaria scheme (UMS) was launched and anti-larval measure were undertaken but , there were high number of cases were recorded in 1976.

In 1977, Malaria eradication was given up and **modified plan of operation (MPO)** was adopted. Area was divided on the basis of API (Annual Parasite Incidence) into, API ≥ 2 and API < 2.

MPO was able to control the malaria deaths at lower level but 1994 onwards, resurgence of malaria was observed in some states with epidemics and increase in mortality. These outbreaks are reported from Rajasthan, Manipur, Nagaland, Assam, Maharashtra, West Bengal and Haryana. Afterwards Malaria action program was formulated in 1994. Problem areas were identified like Tribal area, Epidemic prone area, Project area, triple insecticide resistance area and urban areas. Enhanced malaria control project in 1997 sponsored by World Bank intensified in Tribal population and different States.

National Malaria Control Program has been renamed as "National Malaria Eradication Program" and further renamed as "National Anti-Malaria Program" in 1999. But it has become the part of National Vector Borne Disease Control Program (NVBDCP) under the umbrella of National Rural Health Mission (NRHM) in 2005.

NRHM expected outcome is reduction in malaria mortality by 50% up to 2010 and additional 10% by 2012.

Reasons for persistence of malaria: After the above said activities conducted in still burden malaria is increasing due to drug and insecticide resistance, urbanization with increasing construction sites, wars, civil unrest along with unfavorable ecological changes.

Q37. What is ABER and API, write their importance on the context of Malaria?

(BNMUB, 2002, 2005; SMU, 2009; GNSUB, 2023)

Ans: **ABER** means Annual blood examination rate.

$$\textbf{ABER} = \frac{\text{Number of slide examined in a year}}{\text{Total Population}} \times 100$$

Application: It can be used to analyze trend of fever rate in the community by comparing data from previous years or previous months of same year.

Importance: ABER is an index of operational efficiency where 10% of population should be examined.
API means Annual parasite incidence

$$\textbf{API} = \frac{\text{Confirmed cases during 1 year}}{\text{Population under surveillance}} \times 1000$$

Importance: API is a sophisticated measure of malaria incidence in a community. It is based on intensive active and passive surveillance and cases are confirmed by blood examination.

Areas with API ≥2 per 1000 population per year have been classified as high-risk areas in India and thereby eligible for vector control.

Under modified plan, endemic areas were classified on the basis of API for spraying operation:

- Areas with API <2: Action taken Regular insecticide spray.
- Areas with API ≥2: Action taken Focal insecticide spray.

Q38. Describe the epidemiology of malaria. Write the vector control strategies to prevent malaria in your PHC area.

(TRIU, 2016)

Ans. Epidemiology of malaria

A. **Agent factors:**

Agent:

- Malaria in man caused by four distinct species of the malaria parasite (*P. vivax, P. falciparum, P. malariae and P. ovale).*
- *Plasmodium vivax* has the widest geographic distribution throughout the world.
- In India, 50% infection due to *P. falciparum*, 4-8% mixed infection, rest due to *P. vivax*.
- *P. malariae* less than 1%.
- *P. ovale* is confined to tropical Africa.

- *Reservoir of infection:* Human reservoir harbors sexual form (gametocytes) of parasites.
- *Period of communicability:*
  - In *vivax* infection, gametocytes appear in blood 4-5 days after the appearance of the asexual parasites.
  - In *falciparum* infection, gametocytes appear in blood 10-12 days after the appearance of the asexual parasites.

B. **Host factors:**

- *Age:* Malaria affects all age but newborn have the resistance to *P. falciparum* infection.
- *Gender:* Male populations have the more risk of acquiring malaria.
- *Race:*
  - Individual with sickle cell trait have a milder infection with falciparum than those with normal hemoglobin.
  - Person with blood group "duffy negative" is resistance to *vivax* infection.

- *Pregnancy:*
  - Increase the risk of malaria
  - Primigravid women are at greatest risk.
  - May cause intrauterine death, premature labor and abortion.
- *Socioeconomic development:* Poor socio-economic development favors occurrence of malaria.
- *Housing:*
  - Ill-ventilated and ill-lighted houses provide ideal resting places of mosquitoes.
  - These types of houses favor occurrence of malaria.
- *Occupation:* Malaria is a rural disease and closely related to agriculture practices.
- *Human habits:* Habits such as sleeping outdoors, refusal to accept spraying of houses, re-plaster... walls after spraying and not using personal protection (e.g., bed net) favor occurrence of malar...
- *Immunity:*
  - Infants born of immune mothers generally are protected during first 6 months by mater... antibody.
  - Active immunity is species-specific. Immunity against one stain does not protect against oth...
  - People living in endemic areas exposed continually to malaria develop considerable deg... resistance to clinical disease.

C. **Environmental factors:**

- *Season:* Maximum prevalence from July to November.
- *Temperature:* Optimum temperature for development of malaria parasite in insect vector is be... 20°-30°C.
- *Humidity:* A relative humidity of 60% necessary for mosquitoes.
- *Rainfall:* Mild rainfall and drought favor breeding of mosquitoes.
- *Altitude:* Anophelines are not found above 2,000–2,500 meters.
- *Man-made malaria:* Burrow pits, garden pools, irrigation channels and engineering projects... construction of hydroelectric dams, roads, and bridges have led to the breeding of mosquitoes ... increase in malaria.

For vector control—Integrated vector management in the PHC area.

Q39. Write in brief about clinical feature, mode of transmission and chemoprophylaxis of malaria *(MGUB, 2022; ABKUB, 2023; BNMUB, 2016; TRIU, 2023; BUMP, 2013; SMU, 2015; GNSUB ...*

Ans: Clinical feature: The typical attack comprises three distinct stages, i.e., the cold stage, hot stage and swe... stage.

These are followed by afebrile period in which the patient feels greatly relieved.

Cold stage: The onset is with lassitude, headache, nausea and chilly sensation followed in an hour or s... rigors. The temperature rises rapidly to 39–41°C. Headache is often severe and vomiting. In this stage ... feels cold, later it becomes hot. The pulse rate is rapid and may be weak. This stage last for 1/2–1 hour.

Hot stage: The patient feels burning hot and cast off his clothes. The skin is hot and dry to touch. Headache ... intense but nausea commonly diminishes. The pulse is full and rapid respiration. This stage last for 2–6 hou...

Sweating stage: The fever comes down with profuse sweating. The temperature drops rapidly to norm... and the skin is cool and moist. The pulse rate becomes slower, patients feels relieved and often falls asleep. This stage lasts for 2–4 hours.

Mode of transmission:

- **Vector transmission:** Malaria is transmitted by bite of certain species of infected female anophel... mosquitoes. A single infected vector during her lifetime may infect several people. The mosquitoes ... not infective unless the sporozoites are present in its salivary glands.
- **Direct transmission:** Malaria may be induced accidentally by hypodermic intramuscular and intraven... injections of blood or plasma, e.g., blood transfusion, malaria in drug addicts. Blood transfusion p...

a problem because the parasites keep their infective activity for at least 14 days in blood bottles stored at – 4°C. Persons who have lived in an endemic area (including those who have been taking antimalaria prophylactically) and anyone who had malaria should not accept as donor until 3 years afterwards.

- **Vertical (congenital) transmission:** Congenital infection of newborn from an infected mother may occur but it is rare.

Chemoprophylaxis of malaria: Chemoprophylaxis should be administered only in selective groups in high *P falciparum* endemic areas. Use of personal protection measures including use of long-lasting insecticidal bed nets (LLIN) should be encouraged for pregnant lady and other vulnerable population including travelers for long way. For long stay of military and paramilitary forces in high pf areas should practice of chemoprophylaxis should be followed whenever appropriate.

Short-term chemoprophylaxis up to 6 weeks: Doxycycline, 100 mg once daily for adults. The drugs should be started 2 days before travel and continued for 4 weeks after leaving the malaria endemic place.

Long-term chemoprophylaxis more than 6 weeks: Mefloquine, 250 mg weekly for adults and should be administered 2 weeks before during and 4 weeks after exposure. Mefloquine is contraindicated in individuals with history of convulsions, neuropsychiatric problems and cardiac conditions. So necessary precaution should be taken and all should undergo screening before prescribing the drugs.

Q40. There are few cases of fever in an urban area. As a Medical Officer of the urban area, what will be your instruction to your health workers in the urban center for surveillance of fever cases? Discuss reasons for such instructions. *(BNMUB, 2002; RGUHS, 2008; TDMGRMU, 2008; MUHS, 2019)*

Ans: The main objectives of Urban Malaria Scheme are to control malaria by reducing vector population in the urban areas and reducing morbidity and mortality through early case detection and prompt treatment.
Following instructions are given to the urban health workers by medical officer for surveillance of fever cases.

Activities performed: Case detection should be done for fever cases by examination of blood smears or by rapid diagnostic test **(RDT)** through passive surveillance in the district hospitals, sub-divisional hospitals, urban dispensaries and malaria clinics run by municipal corporation and malaria clinics. In those clinics, prompt treatment was given in already diagnosed cases.

Urban malaria poses a significant problem for malaria eradication program. Urban malaria scheme **(UMS)** was launched in 1971.

Objectives: To control vector population through anti-larval measures. Major vector for urban malaria is ***Anopheles stephensi***.

Area selection criteria:

- Population more than 5,0000
- Slide positivity rate more than 5
- API > 2
- Fever case more than 30%

Control strategies:

- Early detection and treatment of malaria cases
- Bioenvironmental measurements: The towns should be promulgated and strictly implement the civic by-laws to prevent/eliminate domestic and peridomestic breeding places through source reduction and de-weeding and emptying of the water containers like overhead tanks, ponds, etc.
- Controlling larvae by weekly application of Temephos/Fenthion (repeated in frequent intervals as it is a comparatively costly operation) or by using larvivorous fish.

The reasons for such instruction are if malaria cases detected early from the existing fever cases and secondary cases also treated promptly, mortality and morbidity could be prevented. Thus, the Family and Communities by large will be protected from malaria.

Q41a. **About 40 cases of malaria have been detected in a Block primary Health Centre (BPHC) ... month of august 2006. As BMOH of the BPHC, what measure will you take to control such situ...** *(WBUH...*

Q41b. **An outbreak of Malignant Malaria cases have been reported in the district of Purnia. Discuss the ... term control measures to be taken by the Block Medical Officer of Health?** *(BNMU...*

Q41c. **Discuss the short-term control measures for an outbreak of malignant malaria in the district by ... Medical Officer of Health.** *(BNMU...*

Ans. **Short-term measures: Collaboration with Rapid Response Team (RRT)** will be constituted with ... to undertake urgent epidemiological investigations and provide on the spot technical and logistic ... to the medical officer and paramedical staffs.

Arrangement of logistics: Block Medical Officer of Health will ensure availability of following logis... adequate amount like reagents, slides, rapid diagnostic kits, drugs, Insecticides and spray equipmen...

Control of malignant malaria outbreak: Once an abnormal situation is confirmed, RRT will reach th... immediately with mobilization of adequate resources like logistics, money and manpower, etc. The fol... steps are to be taken for the control of epidemics:

- **Estimation of the population involved:** This will be done by taking village wise population from the ... register or the census population of the area identified, whichever is readily available.
- **Delineation of the affected area:** On confirmation of an outbreak in some of the areas of a ... arrangements are made to delineate the area and to find out the extent and severity of outbreak. D... the survey, all the fever cases and individual with recent history fever in every village in the susp... epidemic zone will be put under blood microscopy/RDT. If the affected population is relatively sm... mass survey will be carried out in the entire population irrespective of fever status.

Control measures: Anti-parasitic and anti-vector measures are adopted to control the outbreak.

Anti-parasitic measures: Malignant malaria is an emergency condition and treatment should be ... as per severity and associated complications. The guidelines for specific anti-malarial therapy ... follows:

- **Artesunate:** 2.4 mg/kg body weight IV or IM given on admission, then at 12 hours, 24 hours and once ...

Or

- **Artemether:** 3.2 mg/kg body weight IM given on admission and then 1.6 mg/kg body weight per da...

Or

- **Arteether:** 150 mg IM daily for 3 days in adult only (Not recommended for children)

Or

- **Quinine:** 20 mg/kg body weight on admission (IV infusion) followed by maintenance dose of 10 m... kg body weight 8 hourly. The infusion rate should not exceed 5 mg /kg body weight per hour. When t... patient will be improved, parenteral quinine will be replaced by oral quinine 10 mg/kg body weight thr... times a day for 7 days (including the days when parenteral quinine was administered) plus Doxycycli... 3 mg/kg body weight once in a day for 7 days or Clindamycin 10 mg/kg body weight 12 hourly for ... days. **If the patient receives parenteral artemisinin therapy, patient will receive full course** of oral **ACT for 3 days.**

Anti-vector measures: Indoor residual spray **(IRS)** with DDT or Malathion/Fenthion any will be carri... out in the affected area to control adult mosquitoes. Adequate number of long-lasting insecticidal bed ne... **(LLINs)** should be supplied to the population for personal protection. Suitable **anti-larval measures** w... be also adopted.

After the outbreak has been contained, close surveillance should be carried out for 1 month (twice th... incubation period of malaria).

Q42. An outbreak of malignant malaria cases have been reported in the district of Purnea. Discuss the long-term control measures to be taken by the Block Medical Officer of Health. *(BNMUB, 2006)*/**Discuss the long-term control measures for an outbreak of malignant malaria in the district by Block Medical Officer of Health.** *(BNMUB, 2012)*

Ans: **Long-term measures taken by Block Medical Officer of Health:** These measures will be adopted for prevention of future outbreak:

Strengthening case detection and treatment services through:

- Active case detection is carried out in rural areas with blood smears collected by multipurpose workers during fortnightly visits and passive surveillance should be carried out when the patient with fever cases are reporting at sub-centers by rapid diagnostic tests and at PHC by examination of blood smears
- Laboratories should be fully functional
- Supplies and logistics at all levels are ensured
- Surveillance workers are deployed
- **Integrated vector management: Referred to Q.52**

Q43. Describe and discuss National Antimalaria Program. *(TDMGRMU, 2009; RUHH, 2009)*

Ans: National Malaria Control Program has been renamed as "National Malaria Eradication Program" and further renamed as "National Anti-Malaria Program" in 1999. But it has become the part of National Vector Borne Disease Control Program (NVBDCP) under the umbrella of National Rural Health Mission (NRHM) in 2005.

National Anti-Malaria Program in 1999 was launched. It merged with National Vector Borne Disease Control Program (NVBDCP) in 2004, ultimately it was a part National Rural Health Mission (NRHM) in 2005.

SHORT NOTES AND RELEVANT QUESTIONS ON MALARIA

Q44. Malariometric measures. *(TDMGRMU, 2015; KIMS, 2017; DU, 2000; GNSUB, 2023; MU, 2023)*/**Malaria indices in National Anti-malarial Program.** *(KIMS, 2019)*

Ans: Malariometric measures are the parameters used for measurement of malaria. It is necessary to routinely assess certain parameters to assess the success of surveillance activity. Malaria in an area can be measured by epidemiological parameters such as prevalence, incidence of malaria, entomological parameters and vector indices.

A. Prevalence rate of malaria:

- **Child spleen rate:** It is calculated by the percentage of 2–10 years children showing spleen enlargement. Adult persons are excluded because in adults, splenomegaly may occur in cases other than malaria. **Application:** Spleen rate is used for measuring endemicity of malaria in a community. Depending upon spleen rate, country was classified into following areas. Hypoendemic (< 10%), mesoendemic (11–50%), hyperendemic (51–75%) and holoendemic (>75%). **Significance:** Spleen rate is the best indicator for malaria prevalence in a community.
- **Child parasite rate:** It is the percentage of children between 2–10 years positive for malarial parasite in their blood smears.
- **Parasite density index:** It is the average number of malarial parasite per cubic mm of blood estimated from all positive slides.
- **Infant parasite rate:** It is the percentage of infants positive for malarial parasite in their blood smears. **Most sensitive indicator because it indicates active transmission of malaria in the community.** An area with "0" infant parasite rate for 3 consecutive years, suggests absence of malaria transmission even in presence of anopheline mosquito.
- **Proportional case rate:** It is the number of cases diagnosed as clinical malaria for every 100 patients attending hospitals.

B. **Incidence rates of malaria:** *(VNSGU*

- **Annual parasite incidence (API):** It is the number of new confirmed cases of malaria th microcopy in an area during a given year with the population under surveillance.

$$\text{API} = \frac{\text{Confirmed cases during a given year}}{\text{Total population under surveillance}} \times 1000$$

Under modified plan, endemic areas were classified on the basis of API, such as Areas with API < 2 Regular insecticide spray and Areas with API > 2 – Focal insecticide spray.

- **Annual blood examination rate (ABER):** It is the percentage of population examined for blood s during a given year.

$$\text{ABER} = \frac{\text{Number of slide examined in a year}}{\text{Total Population}} \times 100$$

ABER is an index of operational efficiency where 10% of population should be examined.

- **Slide positivity rate (SPR):** It is the percentage of slides found positive for malarial parasites irrespec of type of species. It gives the information about parasite load in the community.

$$\text{SPR} = \frac{\text{Total number of blood smear positive for MP}}{\text{Total number of blood smear examined}} \times 100$$

- **Annual falciparum incidence (AFI):** It is the confirmed new cases of *falciparum* malaria per 1 population during a given year.

C. Vector indices:

- *Adult vector density (mosquito density):* It is the number of mosquitoes per man hour catch.
- *Human blood index:* It is the percentage of female *anopheline* mosquito containing human blood their stomach.
- *Sporozoite rate:* It is the percentage of anopheline mosquito containing sporozoites in their saliv glands.
- *Biting density (man biting rate):* It is determined by catching mosquitoes by using human as a bait.
- *Inoculation rate:* It is the product of biting density and sporozoite rate.

Q44b. Slide positivity rate (SPR). *(BNMUB, 201*

Ans: Slide positivity rate is an important indicator for measurement of malaria, microscopic diagnosis of malari cases became the best method of diagnosis on account of its high sensitivity and specificity.

Slide positivity rate is the percentage of blood slides positive for malaria parasite against total blood smea examined, irrespective of the type of species. It helps in measurement of the magnitude of the problem. Th is also a useful indicator for deciding high risk areas for indoor residual spray. If the areas having SPR ≥ 5 % spraying with suitable insecticide on priority basis.

Q44c. Discuss surveillance of malaria. *(WBUHS, 2008; RGUHS, 2005; SAMU, 2011; TDMGRMU, 200 SSUHSA, 2008, 2012; MU, 201*

Ans: Active surveillance of malaria: Under the National Vector Borne Diseases Control Program, the active cas detection is carried out by health worker (male).

The fortnightly periodicity of domiciliary visits are undertaken for active case detection. Fortnigh surveillance is conducted because of the incubation period in case of *P. vivax* is 22 days while *P. falciparu* is 35 days. Thus, the surveillance cycle of less than one incubation interval will catch most of the secondar cases before the commencement of next cycle.

Activities conducted in the fortnight visits are:

- Search for fever case or who had fever in between the visits of health worker
- Collection of blood and prepared smears from such cases
- Administration of appropriate anti-malarial medication

Factors influencing air pollution: The levels of air pollution are determined by the interaction between the amount of pollutants released and the following factors:

- **Topography**, for example, mountains, valleys, and coastal areas affect the dispersion and movement of air pollutants.
- **Meteorology**, for example, wind speed, wind direction, temperature inversions, and precipitation affect the dispersion and dilution of air pollutants.
- **Chemical reactions** between pollutants in the atmosphere can lead to the formation of secondary pollutants, such as ozone and particulate matter.
- **Human activities**, such as industrial processes, transportation, and agricultural practices, contribute significantly to air pollution.

Types of air pollutants: Air pollutants can be classified into two main types: primary pollutants and secondary pollutants.

1. **Primary pollutants:** These are pollutants that are emitted directly into the atmosphere from a specific source. Examples include sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM).
2. **Secondary pollutants:** These pollutants are formed in the atmosphere through chemical reactions between primary pollutants and other atmospheric components. Examples include ozone (O_3), formed from the reaction of nitrogen oxides and volatile organic compounds in the presence of sunlight, and secondary particulate matter, formed from the reaction of gaseous pollutants.

Effects of air pollution on human health: Exposure to air pollution can have a wide range of adverse effects on human health, depending on the concentration and duration of exposure, as well as individual factors such as age, pre-existing health conditions, and genetic susceptibility. Some of the most significant health effects include:

1. **Respiratory effects:** Air pollution can irritate the respiratory system, causing coughing, wheezing, shortness of breath, and chest tightness. Long-term exposure can lead to chronic respiratory diseases, such as asthma, bronchitis, and emphysema.
2. **Cardiovascular effects:** Air pollution can increase the risk of heart attacks, strokes, and other cardiovascular diseases. Fine particulate matter is particularly harmful, as it can penetrate deep into the lungs and enter the bloodstream.
3. **Cancer:** Some air pollutants, such as benzene and formaldehyde, are known carcinogens and can increase the risk of developing cancer, particularly lung cancer.
4. **Developmental effects:** Exposure to air pollution during pregnancy can have adverse effects on fetal development, including low birth weight, premature birth, and developmental delays.
5. **Neurological effects:** Some studies suggest that air pollution may also affect the nervous system, potentially contributing to cognitive decline and neurodegenerative diseases.

Factors influencing the severity of health effects: The severity of the health effects of air pollution depends on several factors, including the concentration of pollutants, the duration of exposure, the individual's age and health status, and genetic factors. Children, the elderly, and individuals with pre-existing respiratory or cardiovascular conditions are more vulnerable to the effects of air pollution.

Passive surveillance of malaria: The fever cases are attending to OPDs or hospitals should be examined and treated as per protocol.

- All Allopathic, Ayurvedic, Siddha, Homeopathic practitioners (AYUSH) in the locality should be identified and involved in passive case detection.
- The problem of this type of surveillance is that not all the cases are reported to health centers so there is chance of gross under-reporting.
- Apart from this passive surveillance is carried out in the villages by local voluntary workers, voluntary agencies working locally and using Anganwadi workers and private practitioners, etc.
- The District Malaria Offices should mapping out private clinic and other functionaries for more case detection as well as reporting.
- Health worker (M) should contact all FTDs/DDCs/Voluntary workers, etc., of his area at least once a forth-night in his area and collect blood smears send to laboratory for detection of Pf/Pv if any and also check positive slides and 5% of negative slides through quality Assured Malaria Microscopy (QAMM) and providing drugs on basis of diagnosis on a regular basis.

Q44d. Major epidemiological types of malaria. *(SSUHSA, 2006; MU, 2023)*

Ans: Various problems and constraints were identified for the slow progress of malaria control measures. An analysis of these factors has resulted in the identification of malaria priority areas. The epidemiological types are described below:

A. **Tribal malaria:** The population of tribal areas are contributing about 50 % of *P. falciparum* cases of the country. Infants, young children and pregnant women have been identified as malaria high risk groups followed by mobile tribal population engaged in forest-related activities. Limited health resource and infrastructure and nonavailability of drugs as village level are the common factors for high morbidity and mortality due to malaria.

B. **Rural malaria:** These include irrigated areas of arid and semiarid plants. *A. culicifacies* is the main vector and *P. vivax* is predominant during lean period and *P. falciparum* during periodic exacerbation. In these areas the malaria of low endemicity and health infrastructure in moderately developed.

C. **Urban malaria**: Fifteen (15) major cities including 4 metropolitan cities accounts for nearly 80% of malaria cases covered under urban malaria control scheme. The health infrastructure is well developed. In peri-urban areas malaria situation is influenced by poor sanitary conditions and low socio-economic groups living in unplanned settlements probe to periodic epidemics.

D. **Malaria in project areas:** Project areas are those areas where construction and development activities are taken up and temporary tropical aggregation of laborers takes place bringing in different strains of malaria parasite and nonimmune population. Thus, results in disturbance in ecosystem, prolific increase in vector bleeding places and increased man-mosquito contact favoring high malaria transmission. Those pockets contribute a large number of malaria cases (Pv, Pf) which are highly disproportionate to the relatively small population groups inhabiting the area.

E. **Border malaria:** These are the high malaria transmission belts along the international borders and state borders. These areas having their own problems in regard to malaria control because of mixing of population and poor administrative control.

F. **Forest malaria:** Forests and settlements in recently deforested areas are known to harbor very efficient malaria vectors. These vectors bite humans in their shelters but return to forest for rest, avoiding residual insecticides sprayed indoors in the shelters, malaria transmission is therefore more intense and difficult to control in temporary or newly established forest settlements.

G. **Floods and malaria**: Floods may lead to a rise in incidence of malaria. Flooding may initially flush out mosquito breeding but later results in pools of water creating mosquitogenic conditions. The lag time between the floods and positive malaria epidemic is estimated to be around 6-8 weeks.

Q44e. Radical treatment for *vivax* malaria. *(RGUHS, 2004)*

Ans: Radical treatment is the treatment given to microscopically confirmed cases of malaria.

Objectives: To ensure a complete cure from malaria and to prevent relapse as about 30% relapse ... vivax malaria are seen in India. **It should be noted that relapse rate in *vivax* malaria in India is** ... **30 percent.**

Drug schedule for radical treatment for *vivax* malaria

Age in years	Day 1–Day 3 Chloroquine (mg)	Day 1–Day 14 Primaquine (mg)
Adults (15 years and above)	600	15
9–14	450	10
5–8	300	5
1–4	150	2.5
<1	75	-

Treat with: CQ 3 days + PQ 0.25 mg per kg body weight daily for 14 ...
Chloroquine (CQ): 25 mg/kg body weight divided over three days ... mg/kg on day 1, 10 mg/kg on days 2 and 5 mg/kg on days 3. Consid... **average body weight of 60 kg individual, total 1500 mg CQ** is neede... **for a adult person for consecutive 3 days. Day-1-600 mg, Day-2-60... mg and Day-3-300 mg.**
CQ tab: 150 mg/300 mg tab available in market
Primaquine: 0.25 mg/kg body weight daily for 14 days. Primaquin... contraindicated in infants, pregnant women and individuals with ... deficiency. **For a adult person 14 tabs needed for 14 days.** (7.5 mg tab... **twice daily)**
Primaquine: 15 mg tablet available in the market

Q44. What are the factors responsible for resurgence of malaria. *(RGUHS, 200...*

Ans: The malaria eradication program received a set-back in **sixties (1960s)** with focal outbreaks and it beca... epidemic.

The incidence of malaria raised to 6.4 million in 1976 from 5,0000 in 1961.
Factors responsible for resurgence of malaria are discussed below:

Factors	Description
Technical	• Resistance of mosquito vector to insecticides • Malarial parasite developed resistance to chloroquine due to mutation • Above mentioned factors are partly responsible for malaria eradication program
Administrative	• Shortage of insecticides and anti-malarial drugs • Operation cost increased • Inadequate budget sanctioned by the Government, laxity in national commitment • Shortage of labor in spray work • Diversion of fund to program like family planning • Dependent on multipurpose workers and basic health services
Operational	• Application of eradication measure without considering epidemiological parameters • Inadequate surveillance • Inadequate coverage of residual insecticides • Premature take off to consolidation and maintenance phase • Many workers left the job because it lost charm ant the work became less prestigious

Q45. Write down the approaches of malaria control. *(SSUHSA, 2013; KIMS 20...*

Ans: As malaria eradication was replaced by malaria control, the priorities were changed for control progra... These priorities and approaches based on:

- Epidemiological consideration
- Adverse effect on health
- Economy
- Technical feasibility
- Functional resources
- Human resources and lastly
- Community participation

Q44h. Difference between mosquito and sand fly. *(RGUHS, 2001)*

Ans:

Points of difference	Mosquito	Sandfly
Size	Bigger	Smaller
Wings	Have fringe of scales on the posterior border 1, 3, 6 veins do not branch	• Are upright and lanceolate in shape • 2nd vein branches twice
Legs	Shorter	Longer
Hair	No hair	Hairy
Mobility	Can fly	They hop

Q44i. Enumerate mosquito borne diseases. *(DU, 2015; NU, 2015; SMU, 2011, 2012)*

Ans: The mosquito borne diseases are enumerated below:

Name of the Mosquito	Common species usually found in the regions	Diseases occur
Anopheles	***An. culicifacies*** (Found in plains) ***An. fluviatilis*** (Found in foot-hill regions) ***An. minimus*** (Found in foot-hill regions) ***An. philippinensis*** (Found in plains) ***An. stephensi*** (Found in coastal regions) ***An. sundaicus*** (Found in coastal regions)	Malaria
Culex (Nuisance mosquito)	***Culex fatigans (quinquefasciatus)***	• Lymphatic filariasis • Japanese encephalitis
Aedes (Tiger mosquito)	***Aedes aegypti*** ***Aedes albopictus***	• Dengue • Chikungunya fever • Yellow fever • Zika virus disease
Mansonoides	***M. annulifera*** ***M. uniformis***	Malayan (Brugian) filariasis

Q44j. What is man-made malaria? *(RGUHS, 2002; TDMGRMU, 2015)*

Ans: Malaria consequent to human activities which increase the malaria problems is called man-made malaria. Such activities are industrialization, urbanization, burrow pits, irrigation channel, engineering problems which led to mosquito breeding places.

Q44k. Comment on malaria week and WMD (Antimalaria month campaign). *(RGUHS, 2001)*

Ans: Antimalaria month is observed in June throughout the country as malaria week every year prior to onset of monsoon and transmission season. **World Malaria Day (WMD) was observed on 25th April every year.**

Objectives: To create community awareness through mass media campaign about malaria and its prevention, inter-sectoral collaborative efforts with other Government departments, corporate also voluntary agencies at National, State and District levels.

FILARIASIS RELATED QUESTION ANSWERS

Q45. Describe the epidemiology of lymphatic filariasis and its control in India. *(TRIU, 2023; DU, 2011; GITAMAP, 2023)*

Ans: Lymphatic filariasis is a public health problem of India. Mass Drug Administration (MDA) program has already been started to control this problem. Epidemiological issues are important to know before starting control measures.

Epidemiological determinants:

- **Agent factors:** At least eight species of filarial parasite are specific to man. Of them, three spe... responsible for lymphatic paralysis viz. *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*.
- **Periodicity:** The microfilaria (Mf) of *W. bancrofti* and *B. malayi* display a nocturnal periodic... maximum density of Mf in blood reported is seen **between 8.30 pm and 12.00 midnight**.
- **Life cycle:** Man is the definitive host and mosquito is the intermediate host of Bancroftian and ... filariasis. The adult worm is found in the lymphatic system of man. The female worm gives birth ... Mf per day.

The mosquito cycle begins when Mf are picked by vector culex mosquito. The Mf is the infecti... They undergo physical development but no multiplication. It is called cyclo-developmental propag...

Host factors:

- **Age:** All ages are susceptible to infection.
- **Gender:** Higher prevalence is seen in male.
- Migration helps in infection.
- **Social factors:** Urbanization, industrialization, low literacy, poverty and poor sanitation etc. are ... factors which increase the infection among population.

Environmental factors:

- **Climate:** The breeding of mosquito is found high between 22 and 38°C temperature and 70% ... humidity.
- **Drainage and town planning:** Poor drainage and town planning is associated with bad drainage ... polluted water. Inadequate sewage disposal and poor planning increase the mosquito breeding.

Vectors: The main vectors in India are Culex and sometimes Mansonia. ***Culex fatigans*** and ***M. annu...*** and ***M. uniformis*** are common vectors.

Incubation period: This is long and commonly 8–16 months are required.

Control measures in India:

A. Chemotherapy:

- *Diethylcarbamazine (DEC):* It is safe and effective. Dose is 6 mg/kg body weight per day orally in di... doses for 12 days with a total of 72 mg of DEC per/kg body weight.
- *Filaria control in community*

Preventive chemotherapy (Mass drug administration in Filariasis)

(BUMP, 2013, RUIH, 2023, KIMS ...)

- Large-scale treatment involves a single doses of two medicines and they are given orally annually ... entire at risk population in the following way: Albendazole (400 mg) with DEC 6 mg/kg (except pre... women, children below 2 years of age and seriously ill persons). This large-scale strategy is called preventive **chemotherapy** conducted annually for 4–6 years in India and it can interrupt the transmission cy...
- *Selective treatment:* In India, detected cases are treated with 6 mg of DEC/kg body weight daily for 1... (6 days in a week) and treatment is completed in 2 weeks. In endemic areas, treatment is repeated in specific intervals, usually every 2 years.

B. Integrated vector management under NVBDCP—Q.52.

SHORT NOTES AND RELEVANT QUESTIONS ON FILARIASIS

Q46a. Why Filariasis never causes explosive epidemic? *(ABKUR ...)*

Ans: There are three (3) reasons why filariasis never causes explosive epidemics:

1. The parasite does not multiply in the insect vectors.
2. The infective larvae do not multiply in the human host.
3. The life cycle of parasite is relatively long – 15 years or more.

Epidemiological determinants:

- **Agent factors:** At least eight species of filarial parasite are specific to man. Of them, three species are responsible for lymphatic paralysis viz. *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*.
- **Periodicity:** The microfilaria (Mf) of *W. bancrofti* and *B. malayi* display a nocturnal periodicity. The maximum density of Mf in blood reported is seen **between 8.30 pm and 12.00 midnight.**
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The mosquito cycle begins when Mf are picked by vector culex mosquito. The Mf is the infective form. They undergo physical development but no multiplication. It is called cyclo-developmental propagation.

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- **Gender:** Higher prevalence is seen in male.
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Environmental factors:

- **Climate:** The breeding of mosquito is found high between 22 and 38°C temperature and 70% relative humidity.
- **Drainage and town planning:** Poor drainage and town planning is associated with bad drainage and polluted water. Inadequate sewage disposal and poor planning increase the mosquito breeding.

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Preventive chemotherapy (Mass drug administration in Filariasis)

(BUMP, 2013, RUJH, 2023; KIMS, 2023

- Large-scale treatment involves a single doses of two medicines and they are given orally annually to the entire at risk population in the following way: Albendazole (400 mg) with DEC 6 mg/kg (except pregnant women, children below 2 years of age and seriously ill persons). This large-scale strategy is called **preventive chemotherapy** conducted annually for 4–6 years in India and it can interrupt the transmission cycle.
- *Selective treatment:* In India, detected cases are treated with 6 mg of DEC/kg body weight daily for 12 days (6 days in a week) and treatment is completed in 2 weeks. In endemic areas, treatment is repeated in the specific intervals, usually every 2 years.

B. Integrated vector management under NVBDCP—Q.52.

SHORT NOTES AND RELEVANT QUESTIONS ON FILARIASIS

Q.46a. Why Filariasis never causes explosive epidemic? *(ABKUB, 2008*

Ans: There are three (3) reasons why filariasis never causes explosive epidemics:

1. The parasite does not multiply in the insect vectors.
2. The infective larvae do not multiply in the human host
3. The life cycle of parasite is relatively long—15 years or more.

Q46b. What is night blood examination? *(RGUHS, 2002)*

Ans: Night blood examination is a component of filarial survey. In this method, Blood examination for Filariasis is done at night.

Principle:

- Night blood examination based on the fact that microfilaria of *W. bancrofti* and *B. malayi* occurring in India display nocturnal periodicity, i.e., they appear in large number at night and retreat from the bloodstream during the day.
- This is a biological adaption to the nocturnal biting habits of vector mosquitoes.

Procedure:

- 20 cubic mm blood is collected by a deep finger prick under aseptic conditions and thick smear is prepared with it on a glass slide.
- Along with the slide number age, sex and other factors are recorded on the survey card.
- On the next day the films are dehemoglobinized, dried, fixed with methyl alcohol, stained with Giemsa stain and examined under microscope for microfilaria.

Timing: Between **8.30 pm and 12.00** midnight.

Significance: Night blood examination offer definitive diagnosis of lymphatic filariasis by demonstration of living parasites in the human body.

Q46c. Assessment of filarial control program. *(BNMUB, 2010)*

Ans: Following parameters are used for assessment of filarial control program.

Clinical parameters:

- Incidence of acute manifestation like epididymo-orchitis is observed.
- Prevalence of chronic manifestations like lymphoedema, hydrocele, chyluria , elephantiasis is noted.

Parasitological parameters:

- **Microfilaria rate:** It is the percentage of persons showing microfilaria in their peripheral blood in the sample population.
- **Filarial endemicity rate:** Percentage of the persons showing microfilaria in their blood or disease manifestation or both.
- **Average infestation rate:** It is the average number of microfilaria per positive slide, it indicates microfilaremia in the population.

Entomological parameter:

- Vector density per 10 man-hour catch
- Proportion of mosquitoes positive for all stages of development
- Proportion of mosquitoes positive for infective (stage III 0 larva)
- Annual biting rate

DENGUE RELATED QUESTIONS AND ANSWERS

Q47a. Describe shortly the epidemiology and clinical presentations and classification of Dengue fever. Write down measures to be taken to control dengue outbreak in a town. *(WBUHS, 2013, 2019; BNMUB, 2017, 2018, 2020; GNSUB, 2022; TRIU, 2016, 2017, 2023; GITAMAP, 2023; RGUHS, 2016, 2014; SMU, 2011; SSUHSA, 2015; BUMP, 2008; NU, 2013)*

Ans: Epidemiology of dengue: Dengue is a mosquito borne viral disease which me be fatal. Agent, vectors, host and environment play their role in causation of dengue.

Agent factors: There are four virus serotypes which are designated as **DENV-1, DENV-2, DENV-3, DENV-4.** Infection with any one serotype confers lifelong immunity to that virus serotype. Although all four serotypes

are antigenically similar, they are different enough to elicit cross protection for only a few mon... infection by any one of them. Secondary infection with dengue serotype-2 or multiple infection with ... serotypes lead to severe form of dengue hemorrhagic fever/dengue shock syndrome.

Vector: ***Aedes aegypti*** and ***Aedes albopictus*** are the two most important vectors of dengue. ***Aedes*** ... mosquito bites during the daytime. It breeds in any type of man-made containers or places in wh... stagnates for more than a week, these include drums, jars, cisterns, air coolers, pots, buckets, flow... overhead tanks, underground tanks, tires, roof gutters, refrigerator drip pans, cement blocks, bamboo ... coconut shells, tree holes and places where rainwater collects or is stored. **The above mentioned** conta... **are very important for antiadults and antilarval control measures.**

Host factors: All the ages and both the sexes are susceptible to dengue, but following host factors con... to more severe diseases and complications.

- Infants and elderly
- Obesity
- Pregnancy
- Peptic ulcer disease
- Woman who are in menstruation or have abnormal bleeding
- Hemolytic diseases such as G6 PD deficiency, thalassemia
- Congenital heart disease
- Chronic diseases like diabetes, hypertension, ischemic heart diseases, chronic renal failure an... cirrhosis, etc.
- Patients on steroid or NSAID treatment.

Environmental factors: The population of ***Aedes aegypti*** fluctuates with rainfall and water storage. ... span is influenced by temperature and humidity, survives best between **16–30°C** and a relative humid... 60–80%.

Clinical presentations of dengue fever: The onset of dengue is sudden, with chills, high fever, int... headache, muscle and joint pains which prevent all movement. Within 24 hours retro-orbital pain partic... on eye movements or eye pressure and photophobia developed. Other common symptoms include ext... weakness, anorexia, constipation, altered taste sensation, colicky pain and abdominal tenderness, dra... pain in inguinal region, sore throat and general depression. The skin eruptions appear in 80% of case d... remission of fever.

Characteristic rash in dengue: The rash may be diffuse flushing, mottling or fleeting pinpoint erup... on the face, neck and chest during the first half of the febrile period and a conspicuous rash, that ma... maculopapular or scarlatiniform on 3rd or 4th day. It starts on the chest and trunk and may spread to ... extremities and rarely to the face. It may be accompanied by itching and hyperesthesia. It lasts for 2 h... to several days and may be followed by desquamation.

The incubation period is 3–10 days, commonly 5–6 days. Fever lasts for about 5 days, rarely more t... 7 days after which recovery is usually complete although convalescence may protracted. **Case** fatality ... **exceedingly low (about 0.2%).**

Classification of dengue: Dengue virus infection may be divided into three broad headings:

A. Asymptomatic

B. Symptomatic:

- Undifferentiated (Viral Syndrome)
- Classical dengue fever:
  - Without hemorrhage
  - With unusual hemorrhage

C. Dengue hemorrhagic fever:

- Without shock
- Dengue shock syndrome

Laboratory diagnosis of dengue: *(SAMU, 2016)*

For early diagnosis, ELISA based **NS1 (nonstructural protein 1)** kit has been introduced under the program which can detect the cases from 1st day of infection. IgM capture ELISA tests can detect the cases after 5th day of infection.

Measures for control dengue outbreak (Epidemic) in a town:

- **Prevention and control measures:** There are different strategies for prevention and control of dengue fever.
- **Early case reporting and case management:** This can be achieved by the following measures.
- **Establishment of fever alert surveillance:** For early detection of any outbreak due to a suspected vector borne disease, it is envisaged to train health workers and grass root level functionaries such as ASHAs, AWWs, volunteers at fever treatment depots under NVBDCP, in identification and reporting of fever syndrome to district Vector Borne Disease Control Officer directly under intimation to PHC/CHC. To supplement the surveillance data, a **call center** may be established with the facility to communicate in regional languages. It will alert concerned health facility for any unusual increase in the number of cases.
- **Establishment of sentinel surveillance with laboratory support:** Surveillance of dengue should be proactive. The program envisages employing a proactive surveillance system that will permit prediction of dengue outbreak. The most important component of this proactive system is serological/virological surveillance, which will monitor the dengue virus transmission especially during inter-epidemic periods and to continually provide information on place of transmission, differentiate Dengue or Chikungunya. A network of sentinel surveillance hospitals at regional and district levels is proposed.

There are 521 sentinel surveillance hospitals with laboratory support and 15 Apex Referral Laboratories for augmentation of diagnostic facilities in the endemic states. For early diagnosis, NS1 and IgM captured ELISA kits are being introduced. Both Dengue and Chikungunya diagnostic Kits (IgM captured ELISA) are also available in those Laboratory.

Involvement of private sector in sentinel surveillance: In addition to sentinel surveillance hospitals identified in public sectors, the states shall also identify private clinics/nursing homes in endemic districts for establishing sentinel surveillance sites.

Strengthening of referral services: For advanced diagnostic facilities such as PCR, virus isolation in dengue and other vector borne diseases 15 apex Referral institutions have been identified.

Case management: In case of dengue fever, symptomatic treatment should go on until the patient becomes afebrile and platelet count and hematocrit determination are normal. Patients of dengue fever can be managed on outpatient basis. They need to be carefully followed for hemorrhage or any deterioration and onset of shock, which usually appears towards end of febrile period.

Epidemic preparedness and rapid response: Each endemic state is to prepare a contingency plan dealing with OPD care and emergency hospitalization, making the most effective use of hospital and treatment facilities in case of outbreak of DHF/DSS.

Dengue shock syndrome: *(RGUHS, 2009)*

Criteria for dengue hemorrhagic fever with signs of shock helps diagnose Dengue Shock Syndrome (DSS). The signs for diagnosis a case of DSS are as follows:

- Tachycardia, cool extremities, delayed capillary refill, weak pulse, lethargy, restlessness; the last one may be a sign of reduced brain perfusion.
- Pulse pressure ≤ 20 mm of Hg with increased diastolic pressure, e.g., 100/80 mm of Hg.
- Hypotension by age, defined as systolic pressure < 80 mm of Hg for those aged < 5 years, 80 to 90 mm of Hg for older children and adults.

Plan for management: Should include requirement of beds, equipment and diagnostic materials, drugs, intravenous volume expanders and whole blood. Platelet concentrates are usually not recommended. Generally in the worst situation, the incidence of seriously ill patients requiring hospitalization may be 1% of total dengue cases. All endemic districts should set up Coordination Committee under the chairpersonship of District Magistrate for implementation of contingency plan in the event of dengue outbreak.

Integrated vector management under NVBDCP—Q.52.

Q47b. **The BMOH reported large number of cases clinically suspected (fever, myalgia, backache and retro-orbital pain) to be Dengue. He also referred two cases to district hospital and suspected an outbreak has occurred. As a BMOH how will you investigate and control the outbreak?**

(WBUHS, 2008, 2018; AKUB, 2022; SSUHSA, 2...

Ans: **Chapter 7, Q. 37**

Q47c. **A 25-year-old man reported in medical OPD with high fever, chills and retro-orbital pain. Outline the diagnosis, case management and community intervention as per national guidelines.**

(WBUHS, 201...

Ans: A 25-year-old man reported in medical OPD with high fever, chills and retro-orbital pain which favours the diagnosis of dengue clinically.

Confirmed diagnosis: A case compatible with clinical description of Dengue Fever with at least one of the following:

- Isolation of dengue virus from serum, CSF or Autopsy samples
- Fourfold or greater increase in serum IgG (by hemagglutination inhibition test) or increase in IgM antibody specific to dengue virus.
- Detection of dengue virus or antigen in tissue, serum or cerebrospinal fluid by immunohistochemistry, immunofluorescence or enzyme-linked immunosorbent assay.
- Detection of dengue virus genomic sequences by reverse transcription-polymerase chain reaction.

Case management: In case of dengue fever, symptomatic treatment should go on until the patient becomes afebrile and platelet count and hematocrit determination are normal. Patients of dengue fever can be managed on outpatient basis. They need to be carefully followed for hemorrhage or any deterioration and onset of shock, which usually appears towards end of febrile period.

Q47d. **Control of Dengue as per NVBDCP.** *(TRIU, 2016; SMU, 2011; SSUHSA, 2...*

Q47e. **In Kolkata and its suburbs, a few cases of Dengue are being reported for last 1 month. How Dengue can be diagnosed? What measures do you like to suggest for its control?** *(WBUHS, 2...*

Q47f. **In a block several cases of Dengue are reported for last 1 month. How dengue can be diagnosed?** What measure do you like to suggest for its control and prevention? *(WBUHS, 2018; KIMS, 2016)* You are referred to **Q.47a.**

CHIKUNGUNYA FEVER RELATED QUESTIONS AND ANSWERS

Q48. **Write clinical feature, diagnosis, treatment, control of Chikungunya fever.**

(BNMUB, 2008; ABKUB, 200...

Ans: Chikungunya fever is a dengue like disease, caused by group A virus, transmitted by ***Aedes aegypti*** mosquitoes. The virus was first isolated from patients and mosquitoes during an epidemic in **Tanzania** in 1952-53. Chikungunya is a local word meaning **"doubling up"** owing to excruciating joint pain. The virus occurs widely in sub-Saharan Africa, India and in many areas of Asia.

Clinical features: The disease has a sudden onset with fever, chills, cephalalgia, anorexia, lumbago and conjunctivitis. Adenopathy is also common. About 60-80% patients have morbilliform rash, occasionally with purpura on the trunks and limbs. The cutaneous eruption may recur every 3-7 days. Other symptoms are coffee-ground vomiting, epistaxis, petechiae. A prominent symptom, seen specially in adult patients is arthropathy, from which the disease gets its name. The arthropathy is manifested by pain, swelling, stiffness especially of metacarpo-pharyngeal, wrist, elbow, shoulder, knee, ankle, metatarsal joints.

Incubation period: 4-7 days.

Vector for Chikungunya: *Aedes aegypti.*

- **Diagnosis:** The virus can be isolated from the blood of the febrile patients by the intra-cerebral inoculation in sucking mice or on VERO cells. It can be also diagnosed by reverse transcriptase PCR/Complement fixation test/ELISA.
- **Treatment:** There is no specific treatment and it is usually self-limiting, analgesics, antipyretics like paracetamol, diclofenac sodium along with fluid supplementations are recommended to manage infection and to relieve fever, joint pain and swelling.

Integrated vector management under NVBDCP-Q.52.

JAPANESE ENCEPHALITIS RELATED QUESTIONS AND ANSWERS

Q49. List the arboviral diseases. Explain the epidemiology, clinical features, control of Japanese encephalitis.
(BNMUB, 2006; TRIU, 2021; VKSUAB, 2020, TDMGRMU, 2010, 2015; SSUHSA, 2016, 2021; SAMU, 2016; SMU, 2011; NU, 2012, 2016; DU, 2013)

Ans: The list of Arboviral diseases are described below:

Group A (alpha viruses)	*Group B (Flaviviruses)*	*Others*
• Sindbis • Chikungunya	• Dengue • Kyasanur forest disease • Japanese encephalitis • West Nile fever	• Umbre • Chittor • Ganjam • Venkatapuram • Sandfly fever • African horse sickness

Japanese encephalitis (JE): For the first time severe encephalitis occurred in Japan during 1924.

Epidemiology of Japanese Encephalitis (JE)

- **Agent factors:** Group B arbovirus is transmitted by bite of female culex mosquito. It is a zoonotic disease, infecting mainly animals and incidentally man. Following an infectious mosquito bite, the initial viral replication occurs in local and regional lymph nodes. Viral invasion of the central nervous system occurs through blood. JE is the leading cause of viral encephalitis in Asian and Western Pacific countries.
- **Host factors:** Animal hosts
  Among the animal hosts pigs are the major vertebrate hosts for JE virus. In some places 100 percent pigs may be infected with JE virus. Infected pigs do not manifest any overt symptoms of JE but circulate the virus so that mosquitoes get infected and can transmit the virus to man. **The pigs are considered "amplifiers" of the virus.**
  Birds such as pond herons, cattle egrets, poultry and ducks are involved in the natural history of Japanese Encephalitis.
- **Environmental factors:** Transmission during rainy season and spread of JE depends on agricultural development supported by irrigation.

Vector for JE: *C. tritaeniorhynchus, C. vishnui and C. gelidus.*

Case Definition of Acute Encephalitis Syndrome/Japanese Encephalitis (JE)

Suspect case:

- Acute onset of fever not more than 5–7 days duration
- Change in mental status with/without new onset of seizures, excluding febrile seizures
- Other early clinical findings which may include irritability, somnolence or abnormal behavior greater than that seen with usual febrile illness.

Note: A simple febrile seizure is defined as a seizure that occurs in child aged 6 months to less than 6 years old, whose only finding is fever and a single generalized convulsion lasting less than 15 minutes and who recovers consciousness within 60 minutes of seizure.

In an epidemic situation, fever with altered sensorium persisting for more than 2 hours with a focal seizure or paralysis of any part of body, is termed as encephalitis.

Presence of rash on the body excludes Japanese encephalitis.

AES with symmetrical signs and fever is likely to be cerebral malaria.

Probable case: Suspected case in close geographic and temporal relationship to a laboratory confirmed case of AES/ JE in an outbreak.

Acute encephalitis syndrome (AES) due to other agent: A suspected case in which diagnostic testing is performed and an etiological agent other than AES/JE is identified.

Acute encephalitis syndrome (AES) due to unknown agent: A suspected case in which no diagnostic testing is performed/no etiological agent is identified/test results are intermediate.

Laboratory confirmed case: A suspected case with any of the following markers:

- Presence of IgM antibody in serum and/or CSF to a specific virus including JE/Enterovirus or others
- Fourfold difference in IgG antibody titer in paired sera
- Antigen detection by immunofluorescence technique
- Nucleic Acid detection by PCR
- Virus isolation from brain tissue

In the sentinel surveillance network, AES/JE will be diagnosed by IgM Capture ELISA and virus isolation will be done in National Reference Laboratory.

In an outbreak of suspected JE, must be reported to District and State health office as well as National Centre for Disease Control through quickest mode of communication.

Clinical features of Japanese encephalitis: The course of disease in man divided into three stages:

1. **Prodromal stage:**
   - Onset is acute, with fever, malaise, lethargy and gastrointestinal disturbance.
   - Duration is usually 1-6 days
2. **Acute encephalitic stage:**
   - High fever
   - Convulsions signs of raised intracranial pressure
   - Difficulty in speech, dystonia, ocular palsies, hemiplegia, quadriplegia.
   - Extrapyramidal symptoms like course tremor, altered sensorium
   - Coma
3. **Late stage and sequelae:**
   - Temperature and ESR touch normal
   - Neurological signs become stationary or tend to improve
   - Convalescence may be prolonged with/without residual neurological deficits.
   - Average period between onset of illness and death is 9 days
   - **Case fatality rate 20-40%.**

Management of JE: Symptomatic management like paracetamol, anticonvulsant, clearing of mouth through suction, frequent change of position.

Control of Japanese encephalitis:

- **Vaccination:** During 2006, Government of India launched a program for vaccination against JE and it has been added in Universal Immunization Program (UIP) covering children of 1-15 years. Live attenuated cell culture derived **SA 14-14-2** strain of JE virus is being used. After the recommendation from expert committee, **two doses of JE vaccine** are being given at the age of 9 months and 16-24 months along with routine immunization. **JE vaccine is given in left upper arm, 0.5 mL, subcutaneous route.**
  Killed vaccine introduced in NIS (referred to chapter 10 Q 86c).
- **Integrated Vector Management under NVBDCP—Q.52.**

KALA-AZAR RELATED QUESTIONS AND ANSWERS

Q50. Describe briefly the epidemiological aspects of Kala-azar. Discuss the strategies for control of disease (in a rural area). *(WBUHS, 2009; BNMUB, 2011, 2013; TRIU, 2013; RUJH, 2014)*

Q50a. One adult man attended your hospital with complaints of fever, emaciation, abdominal swelling and darkening of skin. He had a history of travel to Bihar. *(WBUHS, 2024)*

a. What is the most probable diagnosis?
b. How the disease can be treated?
c. What are the preventive and control measures for the disease?

Ans: Epidemiological aspects of Kala-azar:

Kala-azar is a group of protozoal disease and an important public health problem in our country.

- **Agents:** The leishmania are intracellular parasite. They infect and divide within macrophages. At least 19 different parasites have been associated with human infection. Leishmania donovani is the causative agent of Kala-azar. The life cycle is completed in two different hosts—a vertebrate and an insect. In the former, it occurs in an amastigote form and in the latter as a flagellated promastigote.
- **Reservoirs of infection:** There is a variety of animal reservoirs, e.g., dogs, jackals, foxes, rodents and other mammals. Indian kala-azar is considered to be a nonzoonotic infection with man is the sole reservoir.

Host factors:

- **Age:** It can occur in all age group including infants. In India, pick age is 5–9 years.
- **Sex:** Males are affected twice as often as females.
- **Population movement:** Movement of the population (migrants, laborers, tourists) between endemic and nonendemic areas can result in spread of infection. The recent resurgence of kala-azar in west Bengal is an extension of the epidemic outbreak of the disease in 1977 was due to movement of infected persons with kala-azar.
- **Socioeconomic status:** It usually strikes poorest of the poor. As a disease, it more often debilitates than kills and make people become dependent on others.
- **Occupation:** It is strongly associated with occupation. People who work in various farming practices, forestry, mining, fishing have a great risk of bitten by sandfly.
- **Immunity:** Recovery from kala-azar gives a lasting immunity. During active phase of kala-azar, there is impairment of cell mediated immunity that is reflected in the negative skin reaction to lepromin test.

Environmental factors:

- **Altitude:** Kala-azar is mostly confined to the plain, it does not occur in altitude over 2,000 feet.
- **Season:** Generally there is high prevalence during and after rain
- **Rural areas:** It is confined to rural areas, where conditions for breeding of sandflies readily exist compared to urban areas
- **Developmental projects:** Many developmental projects like Forest clearing and cultivation projects, large water resource scheme, colonization and resettlement programs are bringing human beings into areas of high vector and reservoir concentration.
- **Vectors:** *Phlebotomus argentipes* is a proven vector in Kala-azar. Sandflies breed in cracks, crevices, in the soils and buildings, tree holes, caves etc. Overcrowding, ill-ventilation, accumulation of organic matter in the environment facilitates transmission.

Strategies for control of kala-azar in rural area:

1. Strengthening early diagnosis and treatment.
2. Integrated vector management.
3. Health education and community participation.
4. Training of health personnel.
5. Intersectoral coordination.

Strengthening early diagnosis and treatment: For early diagnosis, active and passive surveillance is carried out. **Active surveillance:** It is carried out in endemic areas during a fortnight, designated as "Kala-azar Fortnight" during which peripheral health workers and volunteers carry out door to door search and refer the cases of kala-azar to the treatment centers for confirmation of diagnosis and treatment.

Passive surveillance: Majority of the kala-azar cases are reported by PHC/district hospital. Private practitioners and NGOs have been advised to report the cases to district authority.

Diagnostic test: Under NVBDCP, diagnosis of kala-azar is carried out with **rk-39** when a case presents with fever of more than 2 weeks duration with splenomegaly and not responding to the full course of antimalarial.

Treatment: Oral miltefosine is the drug of choice. The treatment will be provided at all PHCs within the district.

Dosage:

Age-category	Dose per kg body weight
Adult (>12 years) weighing more than **25 kg**	100 mg Miltefosine daily as one capsule (**50 mg**) in the morning and one capsule (**50 mg** in the evening after meal for **28 days**.
Adult (>12 years) weighing less than **25 kg**	50 mg Miltefosine daily as one capsule in the morning after meal for 28 days.
Children (2–11 years)	Miltefosine **2.5 mg/kg** after meal for **28 days.**

Contraindications of Miltefosine: (a) Pregnancy/breastfeeding/refusal to use contraceptive during the treatment period and 2 months after the completion of treatment with Miltefosine, (b) HIV positive serum and (c) Infants and young children.

Second line treatment: Inj. Amphotericin B 1 mg/kg body weight on alternate days for 15 days by IV infusion in 5% dextrose given slowly over 6–8 hours.

If these drugs are not available, injectable sodium stibogluconate can be used.

Integrated vector management under NVBDCP–Q.52

SHORT NOTES AND RELEVANT QUESTIONS ON KALA-AZAR

Q51. Enumerate the causes of resurgence of Kala-azar. *(WBUHS, 20...*

Ans: There was resurgence of kala-azar following withdrawal of insecticide spray in the maintenance phase of National Malaria Elimination Program (NMEP). Epidemics of kala-azar occurred in Northern Bihar in 197... As a result of control measures launched since 1977 in four districts of Bihar, the number of cases was brought down from 70,000 in 1977 to 12,999 in 1980. The control measures stopped after 3 years of initiation, as other areas were ignored and this ignorance has spread to other parts of Bihar.

With the passage of time currently 31 districts of Bihar, 11 districts of West Bengal, four districts of Jharkhand and six districts of Uttar Pradesh, total 52 district endemic for kala-azar. An estimated 129 million population is exposed to risk of kala-azar in the endemic districts of four states. Sporadic cases have been reported from few other states.

Q52. Integrated vector management (IVM). *(WBUHS, 2012, 2016, 2021; MGUB, 2022, 2024; AKUB, 2022; BNMUB, 2020; ABKUB, 2015, 2022; 2023; VKSUAB, 2018; AFUH, 2022; SAMU, 2022; RGUHS, 2014, 2015; KIMS, 2017; NU, 2016, 2017; SSUHSA, 2010; RUJH, 2017, 2023; TRIU, 2016; DU, 2015; SMU, 2011, 2012; MU, 2023; GNSUB, 2023; VNSUS, 2023)*

Ans: Integration is done by using identical vector control methods to control six vector borne diseases viz. Malaria, Filaria, Japanese Encephalitis, Dengue, Chikungunya and Kala-azar under National Vector Borne Diseases Control Program **(NVBDCP), launched in 2003–04. Among the six diseases under the program, five are transmitted by different types of vector mosquitoes and Kala-azar is transmitted by sandflies.**

Goal: To prevent the transmission of vector-borne diseases such as malaria, dengue, Japanese encephalitis, leishmaniasis, schistosomiasis and chagas disease.

Advantages of IVM:

- Optimal use of resources for vector control
- It improves the efficacy, cost-effectiveness, ecological soundness and sustainability of vector control
- It is a cost-effective strategy and could be done under one umbrella, safe use of insecticides and also monitoring of insecticidal resistance

The measure for vector control and protection includes the followings:

- Measures to control adult mosquitoes and sandflies: Indoor Residual Spray (IRS)

IRS usually applied in rural settings and antilarval measure in urban settings because it is operationally difficult and very costly to cover the vast rural areas of the country.

- Antilarval measures: Chemical, biological and environmental
- Personal protection: Use of long-lasting insecticide treated bed nets (LLINs)

Apart from these mentioned measures, supportive interventions are also necessary for successful implementation of the program.

Indoor residual spray *(VBUJH, 2023)*

Control of Malaria and Filariasis vector; Antiadult measures: IRS is used as primary methods for vector control in rural settings. The spraying of indoor surfaces of houses with organo-chlorine compound like DDT and BHC, etc., is done to kill adult mosquitoes. Malathion and Fenthion are the organophosphorus compounds used where the vectors are resistance to DDT.

Control of JE vector: Antiadult measures: As JE vectors are scattered and not amenable to control, aerial or ground fogging with ultra low-volume (ULV) insecticides like Malathion and Fenthion are effective. Cases reported from villages were brought under IRS. The spraying should cover the vegetation around houses, breeding sites and animal shelters in the affected villages. A 2–3 km radius of uninfected village should be covered under IRS.

Control Dengue vector; Antiadult measures: Indoor space spraying with pyrethrum extract (2%) is one of the important activities to kill adult mosquitoes. Fogging during outbreaks—Periodic household spray with pyrethrum 2% extract, where the case was detected. In addition, ultra low-volume (ULV) Malathion spraying of the entire village, may be carried out using vehicle mounted equipment in case of clustering of cases involving a large area.

Control of Chikungunya vector; antiadult measures: IRS and space spraying/fogging with ultra low-volume quantities of malathion during an outbreak to reduce the adult mosquitoes found to be effective in interrupting transmission.

Control of vector for Kala-azar; antiadult measures: Two rounds of DDT indoor residual spray are undertaken in endemic areas and a dosage of 1 g/m^2 is applied on indoor surface up to 6 feet from ground level. Spray up to 6 feet is done in view of hopping nature of sand flies in walls up to 6 feet and coverage of limited surface area being cost-effective.

Antilarval measures: Specially in the urban settings, it operationally difficult and very costly to cover the vast rural areas of the country

A. **Chemical:** Modern larvicides such as Temephos (Abate) which confer long effect with low toxicity are more widely used for control of Malaria, Filariasis, **JE**, Dengue, Chikungunya.
B. **Biological method:** This consists of using larvivorous fish like ***Gambusia affinis*** which fed on the larvae of mosquitoes. Oil should not be applied in presence of fishes and de-weeding should be done before introduction of fish. So can be practiced to control larvae (malaria, filariasis, dengue and chikungunya).
   Role of bacteria: Biocides ***(Bacillus thuringiensis, Bacillus sphaericus)*** are applied in mosquito control.
C. **Environmental (source reduction):** The most important step to reduce/eliminate the breeding places. **For control of anopheles**, drainage or filling, deepening or flushing, management of water level, changing salt content of water and intermittent irrigation are important steps.

For control of *C. fatigans*, filling up of cesspools and open ditches, arrangements for adequate collection, removal and disposal of sewage and wastewater to avoid stagnation of water, etc., are of outmost importance.

For control of *Aedes* mosquito. It prefers small collection clean water as breeding places like discarded tins, empty pots, broken bottles, tyre damps, water storage tanks, cisterns, air coolers, solid waste and coconut shells, etc., should be cleaned up time to time (preferably within 1 week).

For control of vector in kala-azar: Phlebotomus argentipes (sand fly) is a proven vector in kala azar. Elimination of breeding places like cracks in mud or stone walls, rodent burrows, removal fire woods, bricks and rubbish around the houses are required.

Note: Cattle sheds and poultry at a fair distance from human dwellings.

Personal protection: *(RGUHS, 2024)*

Mandatory use of LLINs for all six diseases.

A. **Use of long-lasting insecticidal bed nets [LLINs]** *(KIMS, 2024)*

- It has been proven to be a practical and cost-effective intervention against malaria and highly effective against vector mosquitoes that bite at night.
- It is not only a physical barrier against mosquito bite but also kill the mosquitoes or shorten their life span.
- LLINs are nets treated in the factory with an insecticide incorporated into the net fabric which makes the insecticide last at least **20 washes in standard laboratory testing.**
- **Three years of recommended use under field conditions but their effective life depending on condition of usage, washing and maintenance.**
- Under the program, three sizes are supplied like size 1 is 1 net per person, size 2 is 1 net for 1.8 persons and size 3 is 1 net for 2.5 persons as for example 6 persons will receive at least 3 nets and 8 person 4 nets. There are three LLINs recommended as eligible for public sector procurement by the WHO:
  1. **2% permethrin** incorporated into the polyethylene fibers
  2. 55 mg/m^2 **of deltamethrin** to coat fibers and
  3. 200 mg **alpha-cypermethrin** per square meter polyester netting

B. **Repellents** like indolone, dimethyl phthalate, etc., can be used in the body to prevent mosquito bite.

C. **Window screens:** The aperture should not be larger than **0.0475 inch.**

D. **Protective clothing:** Full sleeves dress, loose dress to reduce the access of mosquitoes to the skin surface may be adopted avoid biting in the daytime.

Entomological surveillance for Dengue cases: It is of paramount importance as virus may be widespread in the community before it is reported. During extremes of temperature, mosquito density becomes very low and the new and innovative methods such as ovitraps are required for detecting the presence of mosquitoes. Efforts to reduce mosquito population during interepidemic periods may be highly effective in preventing epidemic transmission.

Other control measures: Genetic control BCC, GIS, remote sensing, etc., are helpful to disseminate the knowledge and practice in order to control mosquito breeding, to protect from biting and to reduce the transmission, etc.

Genetic control methods: This consists of reduction of the reproductive capacity of mosquitoes.

Several other approaches have been used:

- Sterile male technique: Male mosquito becoming sterilized after exposure to radiation or feeding on chemosterilizing agent
- Hybrid male technique
- Sex distortion
- Gene replacement

Malaria vaccine:

1. Mosquirix [RTS, S/AS01] (Fig. 3.7):

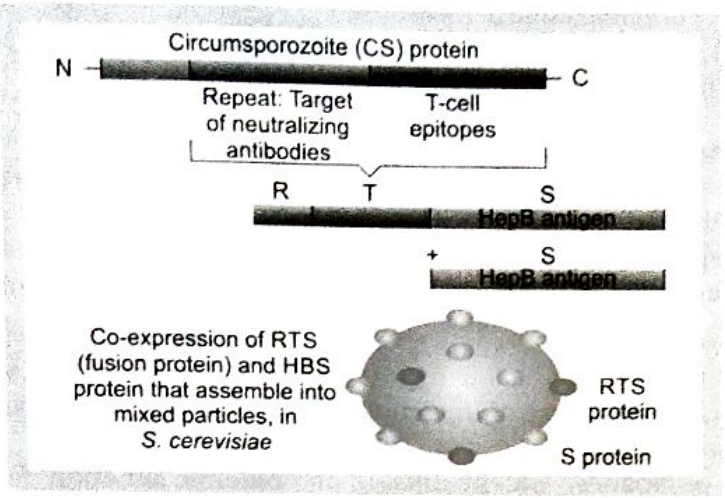

Fig. 3.7: Composition of Mosquirix.
(RTS, S: recombinant protein virus-like particle)

Acronym:

- R = central repeat region of *P. falciparum* circumsporozoite protein (CSP)
- T = T cell epitopes of CSP
- S = Hepatitis B surface antigen (HbsAg)

These are combined in a single fusion protein (RTS) and co-expressed in yeast cells (*Saccharomyces cerevisiae*) with free HbsAg.

Dosage schedule: 0.5 mL, IM; four doses, 5 months onward—first three doses 1 month apart, booster dose at age 2 years (18 months after 3rd dose).

Adverse effect: Mild, fever, pain at injection site and increased risk of febrile seizure.

Efficacy: 30% reduction of hospital admission after use of Mosquirix four dose along with other protective measures.

Advice: Use other methods of preventive measures like LLIN with vaccine.

2. PfSPZ:

- It is a radiation attenuated whole organism vaccine, i.e., it is a weakened form of the parasite that causes malaria. It is capable of entering into the liver cells but cannot develop further.
- It is a chemoprophylaxis vaccine (PfSPZ-CQ). When combined with chloroquine the it is 100% effective.
- Safe and well tolerated in infants and young children.
- Manufactured by Sanaria.
- It is given intravenous.

Behavior change communication (BCC): It is a systematic process that motivates individuals, families and communities to change their inappropriate or unhealthy behavior to healthy behavior. Key supportive strategies laid down under NVBDCP are:

- Early recognition of signs and symptoms of diseases
- Early treatment seeking from appropriate provider
- Adherence to treatment regimens
- Ensuring protection of children and pregnant women
- Use of LLINs
- Acceptance of IRS, etc.

Supportive measures:

- Health education and community participation: It is carried out through mass media, interpersonal communication, acceptance of full course of treatment and other control measures by involving ASHA, CHG, local leaders, etc.

- Human resource development through capacity building
- Intersectoral coordination and convergence with Panchayat, NGOs, public health engineering for implementation of different control measures.
- Monitoring and supervision
- Operational and field research

Q53. A 3-year-old child from Ganganagar area brought to your health center with a history of high fever, chills, headache and vomiting. Baby was found anemic and semiconscious stage. *(TRIU, 2019)*

a. Outline the differential diagnosis.

b. Write down the steps of investigations.

c. Describe the management of this case.

Ans: a. **Differential diagnosis:**

- As the child of 3 years of age having high fever, chills, headache and vomiting, anemic and semi-conscious stage could be a case of uncomplicated malaria. AES with symmetrical signs and fever is likely to be cerebral malaria.
- Could be a case of Japanese encephalitis. In an epidemic situation, fever with altered sensorium persisting for more than 2 hours with a focal seizure or paralysis of any part of body, is termed as encephalitis. Presence of rash on the body excludes Japanese encephalitis.
- Could be case of a simple febrile seizure is defined as a seizure that occurs in child aged 6 months to less than 6 years old, whose only finding is fever and a single generalized convulsion lasting less than 15 minutes and who recovers consciousness within 60 minutes of seizure.
- Diagnosis would be based on history, clinical examination and investigation.
- Malaria can be diagnosed by microscopy or RDT.
- Japanese encephalitis can be diagnosed by presence of IgM antibody in serum and/or CSF to a specific virus including JE/enterovirus or others.

b. We have to investigate the case with protocol of investigation of an epidemic **(Referred to Chapter 7, Q37).**

c. Management of malaria and JE already discussed.

Q54. A large number of cases of fever, rash and severe myalgia in all age groups and both sexes are reported in different health institution of district including 4 deaths in last 7 days. How do you investigate the problem and control it? Suggest measures so that the same will not occur in future.

(KIMS, 2019)

Ans: Sign/symptoms are fever, rash and severe myalgia in all age groups and both sexes are reported in different health institution of district including 4 deaths.

Differential diagnosis:

- Dengue/chikungunya fever
- Measles

We have to investigate the case with protocol of investigation of an epidemic. **(Referred to Chapter 7, Q.37)**

Long-term measures should be taken prevent such occurrence in future. (Referred to Chapter 3, Q42)

CM3.7: Identify and describe the identifying features and life cycles of vectors of public health importance and their control measures.

Identification features of Anopheles of mosquitoes:

Adult	Eggs	Larva	Pupa	Breeding habit	Resting habit
Wings are spotted Palpi long in both sexes	Laid singly Boat shaped Lateral floats present	No siphon tube for breathing	Comma shaped Large eyes Short breathing trumpets with wide openings	Clean water, pond, lakes and river	Hollow trees Bushes, grains and other vegetation

Identification features of Aedes Mosquito (Tiger mosquito):

Adult	Eggs	Larva	Pupa	Breeding habit	Resting habit
Unspotted wings • Dark colored body • White stripes on black colored body • Palpi much shorter than proboscis in female	• Laid singly • Cigar shaped • No floats attached	Siphon tube is short and stout	• Comma shaped • Large eyes • Longer and slender funnel-shaped breathing trumpets with narrower openings	Indoor and outdoor artificial clear water collections, broken tyre, coconut shell, etc.	Animal premises, green bushy fields

Identification features of Culex Mosquito (Nuisance mosquito):

Adult	Eggs	Larva	Pupa	Breeding habit	Resting habit
• Unspotted wings • Palpi shorter than the proboscis in female • No stripes on body	Laid in raft-like groups	Siphon tube is long and slender	• Comma shaped • Large eyes • Longer and slender breathing trumpets with narrow openings	Dirty water-ditches, cesspools, sewers, stagnant drains	Dark shady moist places

Identification features of Mansonia:

- Big, black or brown mosquitoes with speckling on their wings and legs.
- They breed in ponds and lakes containing certain aquatic plants, floating types like *Pistia stratiotes.*
- *M. annulifera, M. uniformis.*
- Diseased caused Malayan (Brugian) filariasis.

Q55. Life cycle of malarial parasite. *(WBUHS, 2019)*

The malarial parasite undergoes two cycles of development—the human cycle (asexual cycle) and mosquito cycle (sexual cycle) **(Fig. 3.8).**

Asexual cycle: It begins when an infected mosquito bites a person and injects sporozoites.

- **Hepatic phase:** The sporozoites disappear within 60 minutes from the peripheral circulation. After reaching in the liver cells after 1-2 weeks they become hepatic schizonts then burst and release merozoites. A single sporozoite of *P. falciparum* releases as many as 40,000 merozoites while other species releases 2,000-15,000 merozoites respectively.
- **Erythrocytic phase:** The merozoites then penetrate the RBC and pass through the stages of trophozoite and schizont. The erythrocytic phase ends with liberation of merozoites which infect fresh red blood cells. The duration of this phase 48 hours for *P. falciparum, P. vivax and P. ovale* and 72 hours for *P. malariae.*
- **Gametogeny**: Male and female gametocytes are formed. These are sexual forms of parasite which are infective to mosquito.

Sexual cycle: The mosquito cycle sporogony begins when gametocytes are ingested by vector mosquito when biting an infected person. The first event take place in stomach and male gametocytes are formed; 4-8 thread like filaments called microgametes are developed. The female gametocyte undergoes a process of maturation and becomes female gamete or macrogamete. By the process of chemotaxis, microgametes are attached towards female gamete and one of which causes fertilization, resulting zygote within 18-24 hours became motile known as Ookinete, which penetrates stomach wall of the mosquito and develops into an oocyst on the outer surface of stomach. The oocyst grows rapidly and develops numerous sporozoites, then migrate to the salivary grands of mosquito then it becomes infective to man. The time required from the gametocyte to sporozoite stage in mosquito is about 10-20 days depending upon favorable conditions of atmospheric temperature and humidity.

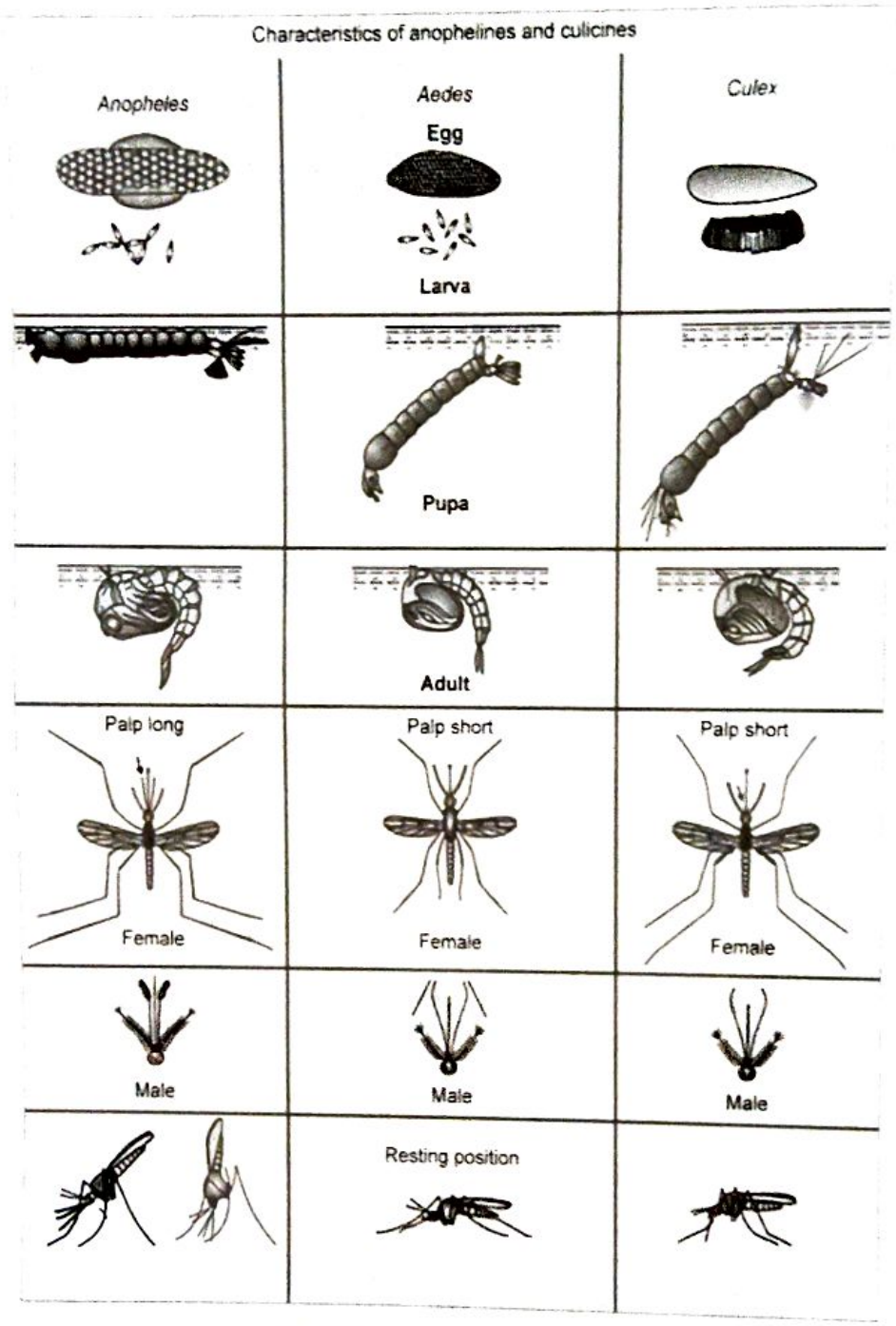

Fig. 3.8: Life cycle of malarial parasite.

Q56. What do you mean by definite host and intermediate host in malaria and why? *(KIMS, 2015)*

Ans: Mosquito is the definite host in malaria. Definite host harbors adult parasite or where parasite replicates sexually. The definitive host refers to the organism wherein the parasite reaches its mature form. Thus, the parasite at this stage is typically capable of reproduction. For example, human tapeworm makes use of human as its definitive host.

Man is the intermediate host in malaria. Intermediate host harbors larval form or parasite replicates asexually.

Identification features of sandfly:

A small insect with the body divided into head, thorax and abdomen

Head is long, slender and hairy antennae: palpi and proboscis

Thorax: The thorax bears a pair of wings and three pairs of legs
Wings: These are upright and lanceolate in shape. In wings the second longitudinal vein branches twice and first branching occurs in the middle of the wing. This is a characteristic feature of the genus, *Phlebotomus*.
The legs are very long, slender and out of the proportion to size of the body. Abdomen is intensely hairy

Life cycle of sandfly:

Adult	*Eggs*	*Larva*	*Pupa*
The average life of a sand fly is about 2 weeks	• Eggs are laid in dump dark places in the vicinity of cattle sheds and poultry • They are comparatively large, torpedo shaped with longitudinal wavy lines on the outside • It hatch within 7 days	They are hairy maggots with distinct head, thorax and abdomen. The last abdominal segment carries two pairs of long stout hairs. One pair is remarkably long. It feeds on decaying organic matter and becomes pupa in about 2 weeks	This stage lasts for about 1 week

CM3.8: Describe the mode of action, application cycle of commonly used insecticides and rodenticides.

Commonly used insecticides available for vector control:

Insecticide group	*Examples*
Group I: Organochlorine compounds	DDT, HCH, dieldrin, chlordane, methoxychlor, etc.
Group II: Organophosphorus compounds	Malathion, fenthion, chlorpyrifos, abate, etc.
Group III: Carbamates	Propoxur, carbaryl

Mode of action, application cycle of commonly used insecticides

Name of the insecticides	*Description*	*Properties*	*Mode of action*	*Application*
DDT (Dichloro-diphenyl-trichloroethane)	DDT was first synthesized in 1874 by German chemist, Zeidler. Insecticidal properties were discovered by Swiss scientist, Paul Muller in 1939.	DDT is a white amorphous powder with a mild but not unpleasant smell. It is insoluble in water but dissolves in most organic solvents Active fraction of DDT is 70–80% of the Para, Para isomer	Primarily contact poison It acts on nervous system of insects It permeates into the insect body through the cuticle, causing paralysis of legs and wings, convulsions and finally death It does not cause immediate death, takes several hours to kill Residual action of DDT may last as long as 18 months	For residual spray, DDT applied at a dose of 100-200 mg per square feet area. Formulation of choice is a 5% suspension of DDT, which when sprayed at a rate of 1 gallon over an area of 1,000 sq feet, gives a dosage of 200 mg per sq ft. As a dust, DDT is used in 5–10% strength for control of lice, fleas, ticks and bugs
Malathion	It is a least toxic of all organophosphorus compounds	It is a yellow or clear brown liquid with an unpleasant smell Commercially, water dispersible powders are available	Contact poison	It used in doses of 100–200 mg per sq ft every 3 months. Used as ultra low volume fogging for killing adult mosquitoes to prevent or interrupt dengue hemorrhagic fever and mosquito borne epidemic encephalitis

Contd...

Contd...

Name of the insecticides	Description	Properties	Mode of action	Application
Propoxur		It is a carbamate non-synthetic insecticide introduced in 1959 with a fast knockdown and long residual effect used against turf, forestry, and household pests and fleas. It is also used in pest control for domestic animals, anopheles mosquitoes, ants and other agricultural pests. It is recommended where anopheles have developed resistance to both DDT and Dieldrin	It direct inhibit acetylcholinesterase	Recommended dose 1–2g/sq meter gives a residual effect of 3 months
Pyrethrum	It is an insecticide of vegetable origin It is prepared by soaking the dried and powdered flowers of ***Chrysanthemum cinerariaefolium*** in kerosine oil for 72 hours	**Active principles:** Pyrethrin I Pyrethrin II Cinerin I Cinerin II	Contact poison	Space spray **Disadvantages:** It does not have any residual action *Note:* Synthetic pyrethroids are 10 times effective than naturally occurring pyrethrins

Mode of action, application cycle of commonly used rodenticides

Commonly used rodenticides are barium carbonate and zinc phosphide.

Name of the rodenticides	Properties	Mode of action	Application
Barium carbonate	It is white tasteless powder and is very cheap	Ventricular fibrillation, respiratory paralysis	It mixed with wheat or rice flour in the ratio of 1:4 The mixed materials is moistened with water and made into small round marbles. The poisoned baits are placed near the rat burrows and in dark scheduled places. After eating the pills, rats are killed in 2–24 hours.
Zinc phosphide	It is an efficient rodenticide, extensively used in India	When moist, the chemical slowly gives off phosphine, a repellent. Low cost. Reasonably high effectiveness makes it to use extensively against large scale destruction of rats. Bait boxes are available	It is used in the ratio of 1:10 in wheat or rice flour and mixed with a few drops of edible oil to make it more attractive to rats. Rats are killed by 3 hours The use of rubber gloves is recommended in handling zinc. Phosphide as it is highly poisonous. Special bait boxes have been designed for the administration of very toxic compounds such as zinc phosphide to eliminate the risk to man and domestic animals. Due to its good safety record with low cost and reasonably high effectiveness, it is used recommended for large scale use.

Other methods of rodent control:

Methods	Description
Fumigation	It is another effective method of destroying both rats and rat fleas. Fumigants used for antirat campaigns are calcium cyanide. Cyanogas has been extensively used in India for the fumigation of rat burrows. This chemical is prepared in powder form and is pumped into rat burrows by a special foot pump called the, "Cyanogas pump". About 2 ounces of the poison are pumped into each rat burrow after closing the exit openings, afterwards, the burrow is promptly sealed with wet mud. After contacting moisture, the cynogas powder gives off hydrogen cyanide gas which is lethal to both rats and their fleas. Trained personnel are required to carry out fumigation because of it is extreme danger to man and livestock. For eradication of rats from ships, either cyanogas or sulphur dioxide is used.
Chemosterilants	A chemosterilants is a chemical that can cause temporary or permanent sterility in either sex or both sexes. Rodent chemosterilants are still in experimental stage.
Trapping	Trapping causes temporary reduction in number of commensal rodents. The 'wonder trap' developed by the Haffkine Institute, Mumbai is created to trap as many as 25 rats at a time. The traps are usually baited with indigenous foods of the locality. The captured rats must be destroyed which may be done by drawing them in water. Rats by nature are suspicious animals and will soon become "trap-wise" and avoided baited traps. It should be considered supplementary to other methods of rodent control.

Supportive measures for control of rodents:

Based on improvement of general sanitation, housing and quality of life. The environmental sanitation measure comprises the following:

- Proper storage, collection and disposal of garbage
- Proper storage of food stuff
- Construction of rat proof buildings, godowns and warehouses
- Elimination of rat burrows by blocking them with concrete.

SHORT NOTES AND RELEVANT QUESTIONS

Q57. Mode of transmission of arthropod-borne diseases/What are the arthropod-borne diseases? *(TRIU, 2014, 2022; BUMP, 2010; SMU, 2013; BNMUB, 2017; SSUHSA, 2018)*

Ans: Transmission of diseases through arthropods and their causative agents are presented as table which will describe mode of transmission.

Causative agents	Disease	Vector
Virus	Yellow fever, dengue fever, dengue hemorrhagic fever, chikungunya, Japanese encephalitis	Mosquito
Rickettsiae	Endemic typhus, tick typhus, Q fever	Louse, tick
Bacteriae	Typhoid, cholera, shigellosis, plague	House, fly rat flea
Protozoa	Malaria, kala-azar	Mosquito, and fly
Spirochete	Relapsing fever	Louse
Nematoda	Filaria, dracunculosis, onchocerciasis	Mosquito, cyclops, black fly

Q58. Environmental control—best approach to control of arthropods. *(WBUHS, 2018; ABKUB, 2023, 24; VNSGUS, 2023, ABKUB, 2023)*

The examples of environmental manipulation are:

- Elimination of breeding places (source reduction)
- Filling and drainage operation

- Carefully planned water management
- Provision of piped water supply
- Proper disposal of refuse and other wastes
- Cleanliness in and around the houses
- Intensive health education of public as well as political support.

Q59. Define blanket treatment with examples. *(RGUHS, 2006; TDMGRMU, 2011)*

Ans: It is a form of treatment in which family is treated if one member of the family is suffering from a communicable disease.
In case of scabies, benzyl benzoate (BB) lotion (25%) is given to all family members.

Advantages:
- Reduction of the communicability of disease
- Reduction of the duration of illness
- Prevention of developments of secondary cases

Disadvantages: If treatment is inadequate or inappropriate, it may induce drug resistance in infectious agent and may frustrate attempts to control the disease by chemotherapy.

Q60. Cyclops. *(RGUHS, 2008; TDMGRMU, 2009)*

Ans: Cyclops or water flea is a crustacean present in most collections of fresh water. It swims in water with characteristic jerky movements.

Morphology:
- It is a tiny arthropod, not more than 1 mm in length
- It has a pear-shaped semitransparent body, a forked tail, 2 pair of antennae, 5 pairs of legs and a small pigmented eye
- It has broad cephalothorax and a narrow abdomen, ending in caudal fork.

Life cycle: The average life of a cyclops is about 3 months.
- After copulation, as the eggs are fertilized in the ovisac, the sac gets detached from the body of the female cyclops. The eggs come out of the sac and get back in the water.
- Eggs hatch after 2-3 days and larvae come out.
- Larva passes through two stages:
  - **First stage:** It is called nauplius, because of its resemblance to ships on sail. This stage last for 5 days.
  - **Second stage:** It is called metanauplius. This stage last for 7 days.

Adult cyclops emerge from metanauplius and entire life cycle is completed in 15 days, showing incomplete metamorphosis.

Control of cyclops: Various methods of control of cyclops are tried to eradicate guinea worm infestation.
- **Physical:**
  - Filtration or straining through piece of fine cloth (double folded)
  - Boiling at 600 C kills the cyclops
- **Chemical:**
  - Chlorine (5 ppm of chlorine destroys cyclops and larva of guinea worm)
  - Lime (4 g of lime per gallon)
  - Abate (an organophosphorus compound effective at a concentration of 1 mg/l)
- **Biological:** Fishes like barbell and gambusia feed on cyclops
- **Environmental:**
  - Abolish step wells
  - Establishment of piped water supply.

Importance:

- Cyclops is the intermediate host of *Dracunculus medinensis* (guinea worm) and *Diphyllobothrium latum* (fish tape worm).
- Man acquires infection by drinking water with infected cyclops.
- Control of cyclops was one the important component of guinea worm eradication program.

Q61. What is Chandler's index? *(RGUHS, 2008, 2012; TDMGRMU, 2009, 2016)*

Ans: Chandler's index is an endemic index of hookworm infection based on the average number of hookworm eggs per gram of stools.

Interpretation:

Average number of hookworm eggs per gram of stool	*Public health importance*
<200	Not much significant
200–250	Potential danger
250–300	Minor public health problem
>300	Major public health problem

Significance: Chandler's index in an indicator used to assess the severity of public health problem of ancylostomiasis. It also helps to evaluate the control measures of ancylostomiasis, following mass treatment.

Q62. Mass drug administration for soil transmitted helminths. *(WBUHS, 2019)*

Prevention of worm infestation *(RGUHS, 2024)*

Ans: Soil transmitted helminth (STHs) infections refer to a group of parasitic diseases in humans caused by intestinal roundworms (ascariasis), hookworms (***Necator americanus*** and ***Ancylostoma duodenale***) and whipworm (***Trichuris trichiura).***

WHO strategy for control of soil-transmitted helminth infection is to control morbidity through periodic treatment of at-risk people living in endemic areas. The people at risk are: (a) Preschool aged children, (b) School going children, (C) Women of childbearing age including pregnant women in second and third trimester and breastfed mothers, (d) Certain adult high-risk occupants such as tea-pickers or miners, etc.

WHO recommended periodic deworming without previous individual diagnosis to all at-risk people living in endemic areas.

Treatment should be given once in a year when prevalence of soil-transmitted helminth infection in the community is over 20% and twice in a year if the prevalence is over 20% for reducing morbidity.

This periodic deworming action should be done in an integrated manner with village health and nutrition days (VHNDs), supplemented programs for preschool children and other school programs as well as promotion of handwashing and improved sanitation practices.

The recommended medicines are albendazole (400 mg) and mebendazole (500 mg).

Treatment of anemia should be done with iron and folic acid as per national programs.

Q63. What is the criteria's for successful parasitism? *(BNMUB, 2018)*

Ans: **Parasitism** is a type of symbiotic relationship, or long-term relationship between two species, where one member, the parasite, gains benefits that come at the expense of the host member.

Successful parasites are small and adept at entering their hosts without being detected. They might release anesthetizing secretions that prevent the host from recognizing it is under attack. Sometimes they are shaped appropriately to fit into their destination body part, or they are able to survive outside their hosts for lengthy time periods. Successful parasites may possess the ability to take on the form of dormant eggs or cysts, which enable them to stay alive until their target host becomes available for invasion. Examples include a flat-

shaped parasite that invades intestines or one with a thread-like body that inhabits blood vessels. Suckers and hooks that keep them from being expelled out of the host body or body part also help parasites succeed in nature. Parasites increase their own fitness by exploiting hosts for resources necessary for their survival in particular by feeding on them and by using intermediate (secondary) hosts to assist in their transmission from one definitive (primary) host to another.

Susceptible host is one who is likely or prone to develop the disease and shows the four stages of successful parasitism. A successful disease agent is one which has a portal of entry, portal of exit, a site of election, survives in the external environment, enters a new host, propagates its species and does not cause the death of host but produce only a low-grade immunity so that the host is vulnerable again and again to the same infection, for example common cold virus.

VENTILATION AND OTHER ISSUES

Q64. Describe types of ventilation. *(WBUHS, 2017; RGUHS, 2012; TDMGRMU, 2009; ABKUB, 2007, 2023)*

Ans: Types of ventilation: There are two types of ventilation: Natural ventilation and mechanical ventilation.

A. Natural ventilation: In this process of ventilation, reliance is placed on certain forces which operate in nature.

- *Perflation and aspiration of wind:*
  - Perflation means blowing of air through room when door and windows are open.
  - When door and windows are facing each other, it is called cross ventilation.
  - When there is obstruction, the air bypasses and exerts a suction action at its tail end is called aspiration.
- *Inequality of temperature:*
  - Air moves from high density to low density
  - The temperature difference between outer and inner air determines velocity of incoming air until temperature difference is nullified. This the basis of natural ventilation.
  - In the topics, outer air may be hotter than inside and reverse may take place.
    These properties of air are utilized to best advantage by proper location of windows, doors, ventilators and skylights. The chief drawback of natural ventilation is that it is not possible to regulate the velocity of the incoming air nor to adjust its temperature or humidity.
- *Diffusion of gases:*
  - Diffusion is passing of air through smaller opening or spaces such as cracks and crevices.
  - It is very slow process and very small.
  - It is of little value as a ventilation mechanism.

B. Mechanical ventilation *(TDMGRMU, 2011)*

It is also called artificial ventilation. They are of four types:

1. *Exhaust ventilation*
   - In this type of ventilation, foul, vitiated air is extracted or exhausted to outside using exhaust fans operated electrically creating a vacuum which is filled in by sucking in of fresh air from outside through windows, doors and other inlets.
   - Usually fixed higher up in wall or roof because vitiated air is warmer and moves up.
   - Air entry can be regulated by adjusting fan speed.

   Application: In large halls, auditorium, cinema halls, kitchen and industries.
2. *Plenum ventilation:*
   - Fresh air is pushed into room by centrifugal fans or higher pressure fans.
   - It creates positive pressure and displaces vitiated air.
   - Air is delivered through ducts at desired points.

   Application: To supply air in air conditioned buildings and factories.

3. *Balanced system:* It employs both exhaust and plenum system of ventilation.
   Application: Used in large halls with extensive sitting capacity and in air conditioning system.
4. *Air conditioning:*
   - Air conditioning is defined as " the simultaneous control of all, or at least first three of those factors affecting both the physical and chemical conditions of the atmosphere within any confined space or room. These factors include temperature, humidity, air movement, distribution, dust, bacteria, odors and toxic gases most of which affect in greater or lesser degree the human health and comfort."
   - Air is filtered when drawn into an air conditioner system from the room.
   - Excess humidity is removed and air is circulated back into room after heating or cooling it to bring room temperature for required comfort.
   - If the temperature difference between outside air and air conditioned room is very large. To prevent sudden exposure to high or low temperature, transition rooms are provided.

   Application: Air conditioners are extensively used in operation theaters, hospitals, hotels, offices, cinema halls, transport vehicles.

Q65. What is comfort zone, mention the ranges of corrected effective temperature?

(RGUHS, 2003, 2012; TDMGRMU, 2012; ABKUB, 2018)

Ans: Comfort zone is the range of effective temperature over which the majority of adults feel comfortable.

- Comfort zone expressed in range because comfort is complex subjective experience depending upon the physical, psychological factors.
- Comfortable thermal conditions are those under which a person can maintain normal balance between production and loss of heat at normal body temperature and without sweating.

Ranges of corrected effective temperature:

- Corrected effective temperature is an arbitrary index combining the effects of air temperature, velocity humidity and mean radiant heat into single value obtained using a globe thermometer.
- Corrected effective temperature is an index of comfort zone.
- Comfort zone are expressed in corrected effective temperature.

Comfort zones	*Ranges of corrected effective temperature*
Pleasant and cool	69°F
Comfortable and cool	69–76°F
Comfortable	77–80°F
Hot and uncomfortable	81–82°F
Extremely hot	83°F
Intolerably hot	86°F

Q66. Describe heat stress indices (HSI) and its effect on health. *(MUHS, 2019; GOAU, 2023)*

Ans: Heat stress is the burden or load of heat that must be dissipated if the body is to remain in thermal equilibrium.

The factors which influence the heat stress are:

- Metabolic rate
- Air temperature
- Humidity
- Air movement and
- Radiant temperature

Heat stress indices are as follows:

- Equatorial comfort index
- Heat stress index
- Predicted 4 hours sweat rate

The heat stress index represents the percentage of the heat storage capacity of an average man. Normogram have been provided from which the value of the heat stress index could be easily calc... interpretation of HIS values are given below:

Grading	Heat stress interpretation
0	No thermal stress
10–30	Moderate to mild heat strain
40–60	Severe heat strain
70–90	Very severe heat strain
100	Upper limit of heat tolerance

Effect of heat stress:

- Heat stroke
- Heat hyperpyrexia
- Heat exhaustion
- Heat cramps
- Heat syncope

Preventive measures:

- Replacement of water
- Regulation of work
- Clothing
- Protective devices usages

Q67. What is greenhouse effect? *(RGUHS ...*

Ans: The greenhouse effect is the process in which the absorption of infrared radiation by atmosphere warms ... planet.

Basic mechanism:

- The earth receive energy from sun in the form of radiation but the energy stored in the atmosphere and ocean does not change in time, so energy equal to the incident solar radiation must radiate back to space.
- Radiation leaving the earth takes two form—reflected solar radiation and emitted thermal infrared radiation.
- This radiation is trapped in the upper atmosphere by the gases known as greenhouse gases thus increasing temperature of the earth.

Greenhouse gases:

- These are gases in atmosphere which trap the reflected infrared radiations from earth
- These infrared absorbing gases are water vapor, carbon dioxide (greatest contributor of greenhouse effect), ozone, methane, nitrous oxide and chlorofluorocarbons.

Causes: Concentration of all these gases has increased in the atmosphere due to human activities like industrial activity (fossil fuel burning) and other human activities such as cement production and tropical deforestation has increased the CO_2 concentration.

Effects:

- Melting of polar ice caps, increase in sea levels resulting in floods
- Increase dryness in climate, smog formation
- Decline in soil moisture due to temperate zone warming
- Change in distribution of vegetation
- Reduction in world food production
- Increased incidence of skin cancer, cataract, spread of tropical disease to temperate climate

Q68. What is the causes and effects of global warming? *(ABKUB, 2011, 2018; TDMGRMU, 2011; SSUHSA, 2015; 2024; GOAU, 2022)*

Ans: The emission of greenhouse gases into the atmosphere have been increasing ever since the beginning of the industrial revolution. A major component of emission of CO_2 is form the combustion of fossil fuel. The main effect for these are increase of about 3°C in the average global surface temperature by 2030, a rise in sea level of 0.1–0.3 meters by 2050, an increase in occurrence of extreme climatic events, cyclones, heatwaves, draughts.

A change of this magnitude would affect local, regional and global ecosystem, sea levels and ocean currents, prevailing winds, fresh water supplies, agriculture, forests, fisheries, industry, transport, urban planning, demographics and human health. Some effects are mutually reinforcing, so a small additional change in the existing trend could have massive effects.

Q69. Describe high altitude/mountain sickness. *(SAMU, 2011)*

Ans: Effects of diminished atmospheric pressure at high altitude. At high altitude, the air becomes thinner, low in temperature and partial pressure of oxygen also becomes less and man cannot survive at an altitude of 25,000 feet without breathing equipment.

- **Acute motion sickness:** It results due to sudden exposure to high altitude of above 10,000 feet.
  Clinical features:
  - Headache, mental fatigue
  - Irritability, irrational behavior
  - Loss of muscular coordination, impaired vision
  - Insomnia
  - Nausea, vomiting
  - Breathlessness
  - Bleed from nose, ringing in ears, palpitation and collapse in severe cases

  Treatment: Bring the person to lower altitude as soon as possible
- **High altitude pulmonary edema.**
  Clinical features:
  - Cough
  - Irregular or Cheyne-Stokes breathing
  - Oliguria
  - Mental confusion, hallucination
  - Stupor, seizures and coma.

  Treatment: Bring the person to lower altitude as soon as possible.

Q70. What is daylight factor? *(TDMGRMU, 2011, 2014)*

Ans: Since the intensity of daylight illumination is liable to change from moment to moment, it is not measured in terms of foot candles. Reliance is placed on a factor called the **daylight factor (DF).** It is the ratio of illumination at a given point to illumination at a point exposed simultaneously to whole hemisphere of the sky (taken as 500 foot candles) excluding direct sunlight. The daylight factor may be summarized as follows:

$$\text{DF} = \frac{\text{Instantaneous illumination indoors}}{\text{Simultaneously occurring illumination outdoors}} \times 100$$

The daylight factor in a building may be rapidly determined by a modified photo-electric meter known as a daylight factor meter. It is recommended that a living rooms, the daylight factor should be at least 8% and in kitchen about 10%.

MULTIPLE CHOICE QUESTIONS (MCQs)

ENVIRONMENTAL HEALTH PROBLEMS

1. Drinking water should be: *(ABKUB, 2016; AFUH, 2022)*
a. Soft water b. Hard water c. Moderately hard water d. Very hard water

2. How much daily supply of water per capita is considered adequate to meet the needs for all domestic purposes? *(ABKUB, 2015)*
a. 5–10 liter b. 50–100 liter c. 150–200 liter d. 500–750 liter

3. Recommended water consumption for a 10 kg child is: *(ABKUB, 2015)*
a. 0.5 liter b. 0.75 liter c. 1 liter d. 1.5 liter

4. Minimum chlorine content of water after chlorination should be: *(AFUH, 2022; TRIU, 2023)*
a. 0.5 mg/L b. 5 mg/L c. 0.05 mg/L d. 50 mg/L

5. Disinfection of chlorine is due to: *(ABKUB, 2023)*
a. Chlorine b. Hypochlorous acid c. Hypochlorite ions d. Hydrogen ions

6. Level of residual chlorine after 1 hour is: *(AKUB, 2023; TRIU, 2023)*
a. 0.5 mg/L b. 1 mg/L c. 1.5 mg/L d. 2 mg/L

7. The test which enable to detect both free and combined chlorine in water with speed and accuracy is: *(YSRUHSAP, 2023)*
a. Horrock's test b. Orthotolidine arsenite test
c. Orthotolidine test d. Presumptive coliform test

8. The freshly made bleaching powder contains about _____ of available chlorine. *(ABKUB, 2019, 2023; SSUHSA, 2023, 2024)*
a. 20% b. 25% c. 33% d. 40%

9. To disinfect water bleaching powder solution have: *(BNMUB, 2005)*
a. 30% available chlorine b. 32% available chlorine
c. 33% available chlorine d. 34% available chlorine

10. Following are true regarding chlorination, *except*: *(ABKUB, 2020)*
a. Residual chlorine of 0.5 mg/L b. Contact period 30 minutes
c. Water should not be turbid d. Chlorine demand should be estimated

11. Chlorine acts best when pH of water is: *(ABKUB, 2019)*
a. 5 b. 7 c. 8 d. 9

12. Disinfecting action of chloride on water is mainly due to: *(ABKUB, 2017)*
a. Hydrogen chloride b. Hypochlorous acid c. Hypochlorite ions d. Hydrogen ions

13. During a sanitary inspection of a rapid sand filtration plant, slowing of the filtration rate was observed owing to loss of head. Which method will you suggest to give head to water in such a situation? *(ABKUB, 2020)*
a. Addition of alum b. Scraping the top layer
c. Increasing duration of storage d. Back washing of sand bed

14. Temporary hardness of water is due to presence of: *(AFUH, 2022; TRIU, 2023)*
a. Bicarbonates of calcium and magnesium b. Chlorides of calcium and magnesium
c. Nitrates of calcium and magnesium d. Oxides of calcium and magnesium

15. NALGONDA technique is used in: *(ABKUB, 2016; SSUHSA, 2023)*
a. Endemic ascites b. Neurolathyrism c. Endemic fluorosis d. Endemic dropsy

16. **Indication of fecal contamination of water is due to presence of:** *(TRIU, 2023)*
a. *E. coli* b. Enterococci c. *Clostridium difficile* d. *Streptococcus pyogenes*

17. **All of the following provide evidence of fecal pollution of water, *except*:** *(AFUH, 2022)*
a. Fecal streptococci b. Coliform c. *Clostridium tetani* d. Enteropathogenic virus

18. **Disinfectant is one which kills:** *(ABKUB, 2018)*
a. Bacteria and spores b. Bacteria only c. Spores only d. Viruses

19. **If a child has been drinking water containing 30 mg/L of nitrates the condition likely to occur is:** *(AKUB, 2022)*
a. Infantile methemoglobinemia b. Dental caries
c. *E. coli* enteritis d. Botulism

VECTOR-BORNE DISEASES

20. **Burden of malaria is best estimated by:** *(AFUH, 2022; 2023)*
a. API b. Mosquito c. Parasite rate d. SPR

21. **The treatment of uncomplicated malaria due to *Plasmodium vivax* is:** *(YSRUHSAP, 2023)*
a. Chloroquine 25 mg/kg divided over 3 days plus primaquine 0.25 ms/kg daily for 14 days.
b. Artemisinin combination therapy and sulfadoxine-pyrimethamine plus primaquine 0.75 mg/kg single dose
c. Artemisinin combination therapy—lumefantrine plus primaquine 0.75 mg/kg single dose
d. Quinine 10 mg/kg three times daily for 7 days

22. **The most sensitive index of recent transmission of malaria is:** *(ABKUB, 2016; GNSUB, 2023)*
a. Spleen rate b. Infant parasite rate
c. Slide positivity rate d. Annual parasite incidence

23. ***Aedes* transmitted all diseases, *except*:** *(ABKUB, 2016; MGUB, 2023)*
a. Chikungunya fever b. Dengue hemorrhagic fever
c. Japanese encephalitis d. Yellow fever

24. **"*Aedes aegypti index*" is kept below 1 around airport area up to perimeter to control yellow fever:** *(KIMS, 2017)*
a. 100 meters b. 200 meters c. 300 meters d. 400 meters

25. **Urban malaria is due to:**
a. *Culex fatigans* b. *Anopheles stephensi*
c. *Phlebotomus argentipes* d. *Aedes aegypti*

26. **Malarial parasite was discovered by:** *(ABKUB, 2018)*
a. Robert Koch b. Louis Pasteur
c. Charles Alphonse Laveran d. Ronald Ross

27. **National Malaria Program is known as:** *(BNMUB, 2002)*
a. National Malaria Control Program b. National Malaria Eradication Program
c. Revised National Malaria Eradication Program d. Revised National Malaria Control Program

28. **NMCP came into existence in:** *(BNMUB, 2002)*
a. 1953 b. 1958 c. 1961 d. 1977

29. **The principal urban vector of malaria is:** *(BNMUB, 2006)*
a. *Anopheles fluviatilis* b. *Anopheles stephensi* c. *Anopheles culicifacies* d. *Anopheles minimus*

30. **The type of host man in malaria is:** *(KIMS, 2016)*
a. Obligate host b. Definitive host c. Intermediate host b. None of the above

31. Development of malaria parasite in mosquito is an example of transmission: *(KIMS, 2015)*
a. Propagative b. Cyclopropagative c. Cyclo-developmental d. Trans-ovarian

32. Mosquitoes that breed in dirty water collection are: *(ABKUB, 2017; AFUH, 2023)*
a. Anopheles b. Culex c. Aedes d. Mansonia

33. The vector responsible for bancroftian filariasis in India is: *(YSRUHSAP, 2023; SSUHSA, 2023)*
a. *Mansonia* b. *Culex* c. *Aedes* d. *Anopheles*

34. Dengue fever is transmitted by: *(ABKUB, 2018; GNSUB, 2023; DBRAUA, 2024)*
a. *Culex* b. *Mansonia* c. *Aedes aegypti* d. *Sandfly*

35. Major deterrent to eradicate of Japanese encephalitis is: *(VKSUAB, 2023)*
a. No effective vaccine b. Breeding place of vector
c. Large number of inapparent infections d. Numerous animal hosts

36. The life span of sand fly is: *(ABKUB, 2005)*
a. 7 days b. 14 days c. 21 days d. 30 days

37. Biological mode of transmission of microfilaria that occurs in *Culex* mosquito is: *(KIMS, 2016)*
a. Cyclo-propagative b. Cyclo-developmental c. Propagative d. Transovarial

38. Which one of the following was the first disease proved to be transmitted by insect? *(ABKUB, 2002)*
a. Kala-azar b. Filaria c. Malaria d. Yellow fever

39. Incubation period of kala-azar is: *(BNMUB, 2004)*
a. 2-7 days b. 1-4 months c. 6-9 months d. 10-14 months

40. Faeces and urine can be disinfected by aqueous solution of lime to act for: *(BNMUB, 2004)*
a. 1 hour b. 2 hours c. 3 hours d. 4 hours

41. Which one of the following is organophosphorus compound? *(ABKUB, 2003)*
a. Paris green b. Pyrethrum c. Bleaching d. Diazinon

42. Which insecticide is a stomach poison? *(KIMS, 2017)*
a. DDT b. Paris green c. Pyrethrum d. Lindane

43. The following are found resistant to DDT, *except*: *(VKSUAB, 2023)*
a. *Phlebotomus* b. *Culex fatigans* c. *Anopheles stephensi* d. *Musca domestica*

ARTHROPOD BORNE DISEASES

44. Sarcoptes scabiei is a: *(ABKUB, 2002)*
a. Parasite b. Crabs c. Arthropods d. Bacteria

45. Scabies is transmitted by: *(ABKUB, 2017; TRIU, 2023)*
a. Mite b. Tick c. Louse c. Rat flea

46. Scabies is caused by: *(ABKUB, 2021; KIMS, 2024)*
a. Mites b. Fleas c. Hard tick d. Soft ticks

47. Six of the ten family members living in a single room house, complain of intense itching with scratching in axillae, groin and hands, it is more marked at night. The most likely diagnosis is: *(ABKUB, 2020; RUHS, 2023)*
a. Scabies b. Dermatitis c. Eczema d. Psoriasis

OTHER ENVIRONMENTAL HEALTH PROBLEMS

48. Open space all-round the house is called:
a. Field back b. Set back c. Parapet d. Hatch back

49. Recommended maximum/highest level (db) of noise/sound/tolerable loudness is: *(WBUHS, 2023; ABKUB, 2017; RUJH, 2023)*

a. 65 dB b. 85 dB c. 90 dB d. 80 dB

50. The sound level (in dB) during whispering is: *(GNSUB, 2023; ABKUB, 2019)*

a. 0 b. 10 c. 20 d. 40

51. Repeated or continuous exposure to noise around _____ may rapture tympanic membrane and cause permanent hearing loss: *(KIMS, 2015)*

a. 89 db b. 100 db c. 140 db d. 160 db

52. Incubation period of staphylococcal food poisoning is: *(BNMUB, 2002)*

a. 1-3 hours b. 1-6 hours c. 12-24 hours d. 12-36 hours

53. Incubation period of hepatitis B is: *(BNMUB, 2002)*

a. 45-100 days b. 45-180 days c. 30-90 days d. None of the above

54. The chief mode of transmission for hepatitis A is: *(ABKUB, 2015)*

a. Parenteral route b. Feco-oral route c. Sexual transmission d. Direct contact

55. The ideal method of collection of solid waste at household level is: *(ABKUB, 2019)*

a. Through central bins b. Safe burial c. Burning d. Door to door collection

56. Soiling index is used for: *(KIMS, 2017)*

a. Water pollution b. Air pollution c. Radiation hazard d. Noise pollution

57. All of the followings are indicators of air pollution, *except*: *(ABKUB, 2017)*

a. Soiling index b. McArdle's index

c. Suspended particle count d. SO_2 concentration

58. Kata thermometer is used now-a-days to determine: *(ABKUB, 2023)*

a. Humidity of air b. Low air velocity

b. Direction of air flow d. Colling power of air

59. The sunscreen cream for preventing adverse effects of UV rays on the skin should have a Sun protection factor (SPF) of: *(ABKUB, 2019)*

a. 5-10% b. 15-30% c. 40-50% d. 100%

60. The following statement is false about greenhouse effect:

a. Life on earth is possible due to the greenhouse effect

b. The greenhouse effect is natural process that maintains the earth's temperature

c. Increased emission of greenhouse gases is a natural process

d. Increased emission of greenhouse gases in the atmosphere increase earth's temperature

61. Among the greenhouse gases, the percentage of CO_2 is: *(ABKUB, 2019)*

a. 25% b. 50% c. 75% d. 90%

62. UV rays are a type of: *(ABKUB, 2019)*

a. Nonionizing radiations b. Electromagnetic radiations

c. Corpuscular radiations d. Magnetic waves

EXCRETA DISPOSAL

63. Manure pits can be used to dispose which type of waste in rural area? *(ABKUB, 2019)*

a. Cattle dung b. Sewage c. Plastics d. Animal carcasses

64. Biochemical oxygen demand indicates: *(ABKUB, 2015)*

a. Organic matter b. Bacterial content c. Anaerobic bacteria d. Chemicals

65. Oxidation pond works on: *(ABKUB, 2019; AFUH, 2022; WBUHS, 2023)*

a. Aerobic principle during night and anaerobic during day
b. Aerobic principle during day and anaerobic during night
c. Aerobic principle in both day and night
d. Anaerobic in both day and night

66. Trap is present in: *(YSRUHSAP, 2023)*

a. Research cum action project latrine
b. Dug well latrine
c. Bore hole latrine
d. Pit latrine

67. Excreta disposal methods used in air craft is:

a. Aqua privy
b. Septic tank
c. Mechanical composting
d. Chemical closet

MISCELLANEOUS

68. A problem village is one where no source of safe water is available within a distance of: *(MGUB, 2023, 2024; ABKUB, 2023)*

a. 1 km
b. 1.6 km
c. 1.8 km
d. 2 km

69. Vector for Japanese encephalitis is: *(TRIU, 2023; RUJH, 2023; ABKUB, 2023)*

a. Group B arbovirus
b. Culex vishnui mosquito
c. *Aedes aegypti* mosquito
d. Pig

70. Organophosphorus insecticides include all, *except*: *(MGUB, 2023, 2024)*

a. Temephos
b. Malathion
c. Propoxur
d. Dichlorvos

71. In India, the reservoir of infection for visceral leishmaniasis (kala-azar) is: *(MGUB, 2023, 2024)*

a. Human beings only
b. Dogs
c. Rodents
c. All of the above

72. Which of the following anopheles is responsible for malaria in the foothills in North-East region? *(SSUHSA, 2023)*

a. Anopheles stephensi
b. Anopheles dirus
c. Anopheles culicifacies
d. Anopheles minimus

73. A 5 member family was residing in a small house. The available floor space to one person was 30 sq ft. The problem which is more likely to be associated with the available space is:

a. Psychological
b. Malnutrition
c. Typhoid
d. Enterobius vermicularis
e. Malaria

74. Which of the following disease is not a water borne disease: *(GNSUB, 2023)*

a. Polio
b. Typhoid fever
c. Hepatitis-A
d. HIV infection

75. Which one of the following is not a water-borne disease? *(ABKUB, 2023)*

a. Giardiasis
b. Amoebiasis
c. Stronglyloidiasis
d. Taeniasis

76. Hardness of water is due to all, *except*: *(VNSGUS, 2023)*

a. Sulphates
b. Chlorides
c. Nitrates
d. Phosphates

77. Association between hardness of drinking water and death rate from heart disease is: *(RUJH, 2024)*

a. Direct
b. Inverse
c. Not associated
d. Indirect

78. Orthotolidine (OT) test is used to determine: *(RUJH, 2024)*

a. Sulphate
b. Chlorine
c. Calcium
d. Carbonates

79. Which of the following is not a component of safe and wholesome water? *(RUJH, 2024)*

a. Pleasant to smell
b. Free from harmful chemical
c. Not necessarily colorless
d. Free from biological agent

80. A sample of water taken from a water storage tank of a residential area was to be examined bacteriologically. A positive test of water sample by multiple tube method refers to the presence of: *(VNSGUS, 2023)*

a. Coliform organisms
b. Fecal. stertococci
c. Nitrates
d. *Cl. perfringens*
e. Fungi

81. A water sample was taken from a village. On chemical analysis the fluoride level was found to be 0.03 mg/L. The likely effect on the body is: *(VBUJH, 2023)*

a. Dental fluorosis b. Dental caries c. Skeletal fluorosis d. Abdominal colic

82. Horrock's apparatus estimates: *(WBUHS, 2024)*

a. Coliform count of water
b. Chlorine demand of water
c. Air pollution quality
d. Air velocity

83. A 10-month-old child was brought by the mother at the OPD, presenting with loose stool more than three times and vomiting from last night. On examination, the child was found to be restless, with sunken eyes and skin turgor was going back slowly. What is the dehydration status of the child? *(WBUHS, 2023)*

a. No dehydration b. Mild dehydration c. Some dehydration d. Severe dehydration

84. Features of staphylococcal food poisoning include all, *except*: *(MGUB, 2024)*

a. Due to enterotoxin
b. Incubation period below 6 hours
c. Sudden onset
d. Fever common

85. What is the concentration (mmol/L) of potassium in ORS? *(AKUB)*

a. 10 b. 20 c. 40 d. 90

86. The presence of streptococci in drinking water indicates: *(GOAU, 2023)*

a. Recent pollution of water from human waste
b. High concentration of Oxygen
c. Past pollution of water from animal water
d. Oxygen depletion and reduction of nitrites to nitrates

87. Which of the following does not break the chain of transmission in typhoid? *(ABKUB, 2023)*

a. Pasteurization of milk b. Chlorination of water
c. Fly control measures d. Mosquito control measures

88. Which of the following is a correct statement? *(ABKUB, 2023)*

a. Food poisoning can be caused by drinking contaminated water
b. Diarrhea is a common feature in acute gastroenteritis and in all forms of food poisoning
c. Food poisoning due to *Bacillus cereus* can present like acute gastroenteritis
d. None of the above

89. All of the following are mosquito-borne diseases, *except*: *(SSUHSA, 2024)*

a. Cerebral malaria b. Q fever c. Chikungunya d. Dengue

90. All the following diseases are mosquito borne, *except*: *(SSUHSA, 2023)*

a. Endemic typhus b. Dengue c. Chikungunya d. Yellow fever

91. Which of the following is not spread by Aedes mosquitoes? *(KIMS, 2023)*

a. Dengue fever b. Chikungunya fever c. Yellow fever d. Filariasis

92. Disease transmitted by culex vector is: *(RUJH, 2023: ABKUB, 2023)*

a. JE b. Malaria c. Dengue d. Yellow fever

93. Eggs are laid in rafts in: *(VNSGUS, 2024)*
a. Aedes b. Culex c. Anopheles d. Mansonia

94. The biological transmission in case of filariasis is: *(GOAU, 2023)*
a. Cyclo-propagative b. Cyclo-developmental
c. Propagative d. None of the above

95. The transmission of filariasis is an example of: *(AKUB, 2024)*
a. Propagative transmission b. Cyclical transmission
c. Cyclo-developmental transmission d. Cyclo-propagative transmission

96. Which mode of transmission is followed in transmission of microfilaria through a female Culex mosquito? *(ABKUB, 2023; GNSUB, 2023)*
a. Cyclo-propagative b. Propagative c. Cyclo-developmental e. Vehicle-borne

97. Biological transmission through mosquitoes in case of malaria is an example of: *(WBUHS, 2023)*
a. Propagative b. Cyclo-propagative c. Cyclo-developmental d. All of the above

98. Cyclo-propagative transmission is seen in: *(SSUHSA, 2023)*
a. Plague b. Cholera c. Malaria d. Filaria

99. The term "Benign tertian (BT)" is used for malaria caused by: *(TRIU, 2023)*
a. *P. vivax* b. *P. falciparum* c. *P. malariae* d. *P. ovale*

100. Rapid diagnostic test of malaria based on detection of antibodies against histadine-rich protein 2 is used for diagnosis of: *(VNSGUS, 2023)*
a. *Plasmodium falciparum* b. *Plasmodium vivax*
c. *Plasmodium ovale* d. All of the above

101. All of the following are helpful for elimination of filariasis, *except*: *(RUJH, 2024)*
a. Microfilaria do not multiply in vectors
b. They multiply in humans
c. Larvae are deposited on skin surface where they cannot survive
d. Mass drug administration

102. Mass Drug Administration is not done in children below the age of: *(GNSUB, 2023)*
a. Less than 6 months old age child b. Less than 2 years old child
c. Less than 5 years of child d. All of the above correct

103. The amplifier for Japanese encephalitis is: *(TRIU, 2023)*
a. Horse b. Pig c. Dog d. Monkey

104. Kala-azar is transmitted by: *(ABKUB, 2023)*
a. *Phelebotomus sergenti* b. *Phelebotomus papatasi*
c. *Phelebotomus argentipes* d. All of the above

105. Which of the following is correct about kala-azar in India? *(SSUHSA, 2024)*
a. Monkeys are the only reservoir b. No extra human reservoir
c. Transmitted by sand fly d. Tetracycline is the treatment

106. Disease transmitted by sand flies are all *except*: *(KIMS, 2019)*
a. Relapsing fever b. Kala-azar c. Oriental sore d. Sand fly fever

107. All of the following insecticides are contact poisons, *except*: *(TRIU, 2024)*
a. DDT b. Malathion c. Pyrethrum d. Paris green

108. Residual action of DDT may last as long as: *(DBRAUA, 2024)*
a. 1 month b. 6 months c. 18 months d. 36 months

109. **Stomach poison among insecticides is:** *(DBRAUA, 2024)*
a. Paris green b. Pyrethrum c. Methyl bromide d. Nicotine

110. **Kyasunur forest disease is transmitted by:** *(GNSUB, 2023)*
a. Mosquito b. House fly c. Rat flea d. Hard tick

111. **Cases of scrub typhus are reported from a block in West Bengal. What is the vector of scrub typhus?** *(WBUHS, 2023)*
a. Flea b. Mite c. Louse d. Tick

112. **Which is the vector for relapsing fever?** *(TRIU, 2024)*
a. Tick b. Anopheles mosquito c. Bed bug d. Housefly

113. **Which of the following disease not transmitted by hard tick?** *(RUJH, 2023)*
a. Q fever
b. Rocky mountain spotted fever
c. KFD
d. Tularemia

114. **Which of the following pairs of rickettsial diseases—insect vector/s is wrongly matched?** *(VBUJH, 2023)*
a. Epidemic typhus—louse
b. Scrub typhus—flea
c. Rocky mountain spotted fever—tick
d. Rickettsial pox—mite

115. **The presence and development of insect vectors on the body or linen as for example, louse, is known as:** *(ABKUB, 2023)*
a. Infection b. Infestation c. Infectiousness d. Infectivity

116. **In a house consisting of two living rooms, the door and windows are facing each other. This will provide:** *(VNSGUS, 2023)*
a. Low humidity b. Aspiration c. Cross ventilation d. Diffusion
e. Acoustic discomfort

117. **The cooling power of air measured by:** *(WBUHS, 2023)*
a. Kata thermometer b. Anemometer c. Sling psychrometer d. Hygrometer

118. **All are indicator of air pollution, *except*:** *(KIMS, 2019)*
a. Oxygen
b. Sulpher dioxide
c. Grit and dust measurement
d. Smoke Index

119. **The best parameter to measure air pollution is:** *(MU, 2024)*
a. CO_2 b. SO_2 c. CO d. N_2O

120. **Green-house gases do not include:** *(AFUH, 2023)*
a. Carbon dixide b. Carbon monoxide c. Water vapor d. Methene

121. **In sanitation barrier, most effective steps of prevention of disease transmission is:** *(AKUB, 2023)*
a. Personal hygiene
b. Control of flies
c. Segregation of feces
d. Protection of food and water supply

122. **Sanitary barrier implies all, *except*:** *(KIMS, 2019)*
a. Segregation of faeces
b. Personal hygiene
c. Control of flies
d. Water pollution

123. **In a poor community, there is high prevalence of acute diarrhea cases. The best method for preventing this health problem in the long run is:** *(VNSGUS, 2023)*
a. Antidiarrheal drugs
b. Immunization against cholera and typhoid
c. Provision of sanitary latrine
d. Use of boiled water
e. Living in fly proof zone

124. Chandler's index is used in epidemiological study of:

a. Hook worm infestation
b. Round worm infestation
c. Guinea worm infestation
d. Amoebiasis

125. Repeated or continuous exposure to the sound level in (dB) leading to permanent hearing

a. 89
b. 100
c. 140
d. 160

Answers:

1.	c	**2.**	c	**3.**	c	**4.**	a	**5.**	b	**6.**	a	**7.**	c	**8.**	c	**9.**	c	10.	
11.	b	**12.**	b	**13.**	d	**14.**	a	**15.**	c	**16.**	a	**17.**	d	**18.**	b	**19.**	a	20.	
21.	a	**22.**	b	**23.**	c	**24.**	d	**25.**	b	**26.**	c	**27.**	a	**28.**	a	**29.**	b	30.	
31.	b	**32.**	b	**33.**	b	**34.**	c	**35.**	d	**36.**	b	**37.**	b	**38.**	a	**39.**	b	40.	
41.	d	**42.**	b	**43.**	d	**44.**	c	**45.**	a	**46.**	a	**47.**	a	**48.**	b	**49.**	b	50.	
51.	d	**52.**	b	**53.**	b	**54.**	b	**55.**	d	**56.**	b	**57.**	b	**58.**	b	**59.**	b	60.	
61.	c	**62.**	a	**63.**	a	**64.**	a	**65.**	b	**66.**	a	**67.**	d	**68.**	b	**69.**	b	70.	
71.	a	**72.**	b	**73.**	d	**74.**	d	**75.**	d	**76.**	d.	**77.**	b	**78.**	b	**79.**	c	80.	
81.	b	**82.**	b	**83.**	c	**84.**	d	**85.**	b	**86.**	a	**87.**	d	**88.**	a	**89.**	b	90.	
91.	d	**92.**	a	**93.**	b	**94.**	b	**95.**	c	**96.**	c	**97.**	b	**98.**	c	**99.**	a	100.	
101.	c	**102.**	b	**103.**	b	**104.**	c	**105.**	c	**106.**	a	**107.**	d	**108.**	c	**109.**	a	110.	
111.	b	**112.**	a	**113.**	c	**114.**	b	**115.**	b	**116.**	c	**117.**	a	**118.**	a	**119.**	b	120.	
121.	c	**122.**	d	**123.**	c	**124.**	a	**125.**	b										

FILL IN THE BLANKS WITH APPROPRIATE WORD(S)

1. Hardness of water can be removed by adding _____ (Chlorine / Lime / $CuSO_4$ / Mineral oils)
2. Residual chlorine content in water supply should be _____ *(KIMS, 2017; SSUHSA*
3. The point at which chlorine demand of water is met is known as _____
4. _____ is used in the field to determine the dose of bleaching powder.
5. Nalgonda technique is used to remove _____ from water.
6. Presence of fecal streptococci in drinking water indicates _____ fecal pollution of water. *(KIMS, 2015; MU*
7. _____ is the most serious but rare type of food poisoning.
8. Phenomena of relapse seen in _____ malaria.
9. Most sensitive indicator of malaria transmission in a community is _____
10. _____ is the only practical approach to malaria control.
11. Japanese encephalitis is transmitted by _____ mosquitoes.
12. _____ is the definitive host of JE virus.
13. _____ is the definitive host in filariasis.
14. The vector for transmission of dengue is _____
15. Vector for kala-azar is _____ *(KIMS, 2015; SSUHSA*
16. The floor area of a living room should be at least _____ sq ft.
17. Sanitation barrier prevents _____ to reach the host.
18. Kata thermometer is used for recording of _____
19. Atmospheric pressure is measured by _____

20. _____ is an indicator of air pollution. *(VKSUAB, 2016)*
21. Waste water from kitchen is called _____ (MU, 2024)
22. _____ a common indicator of fecal pollution of water *(SSUHSA, 2023)*

Answers:

1. Lime
2. 0.5 mg/L for 1 hour
3. Breakpoint chlorination
4. Horrock's apparatus
5. Fluoride
6. Recent
7. Botulism
8. *Plasmodium vivax*
9. Infant parasite rate
10. Surveillance
11. *Culex*
12. Pig
13. Man
14. *Aedes aegypti/albopictus*
15. Sandfly
16. 110 (One Hundred and Ten)
17. Infection/infestation
18. Air temperature
19. Barometer
20. Suspended particulate matter (SPM)
21. Sullage
22. Coliform

TRUE OR FALSE

1. Residual chlorine content in water supply system is 0.5 PPM. *(SAMU, 2015)*
2. Setback area in a rural house be 1/3rd of build-up area. *(SSUHSA, 2023)*

Answers:

1. True
2. False

CHAPTER

4

Principles of Health Promotion and Education

CM4.2: Describe the methods of organizing health promotion and education activities at individual family and community settings.

Methods of organizing health promotion and education activities at individual family and community settings: Most of health behavior is learned through the following means:

Family: The foundation of learning is laid by the family and its environment. In a family, parents have the responsibility to cultivate healthy behavior in their children.

Examples: Practice of washing hands, wearing shoes, using toilets, brushing teeth, no smoking, dietary habits are developed in the family and home.

Extra-familial institutions: The Anganwadi and Creche are extra-familial institutions where young children learn in an informal manner through play activities. It is a joyful learning.

School: Health education in schools (GOAU, 2021): It is formal institution of learning. Learning in school is a cherished memory for lifelong period. Universal elementary education, schooling of minimum of 8 years for everyone is a nation building activity apart from personality development and developing healthy lifestyles and value system.

Learning through peers has great influence on the life of school children and it continues in colleges and higher institution. Prevention of HIV/AIDS and reproductive health can be taught at appropriate age.

Population education: It was an effort initiated under the Family Welfare Program by GOI with an emphasis on life cycle approach. Its focus is young adolescents in schools, colleges and out of schools. Population education was introduced in the school education system, adult education program and higher education system in the country with UNFPA assistance.

At sub-center, PHC, CHC/hospitals: The education and information is provided to targeted specific groups like women of reproductive age group, eligible couples, pregnant and nursing mothers and young children. The main focus of education is reproductive and child health and vaccine preventable diseases.

At workplace: Corporate house/industrial set-up or business organizations have responsibility to provide health information to their staff, regular health check-up, healthy environments, healthy diet and physical exercise.

CM4.1: Describe various methods of health education with their advantages and limitations.

Q1. Describe different methods of health education communication. *(BNMUB, 2017; SSUHSA, 2020; MGUB, 2023; RUHL, 2023, 2024, ABKUB, 2024)*

Ans: Different methods of health education:

A. **Individual approach:** (a) Personal contact, (b) Home visit, (c) Personal letters

B. **Group approach:** (a) Lecture, (b) Demonstration, (c) Discussion methods: (i) Group discussion, (ii) Panel discussion, (iii) Symposium, (iv) Workshop, (v) Conference and seminar, (vi) Role play

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A. **Individual approach:** (a) Personal contact, (b) Home visit, (c) Personal letters

B. **Group approach:** (a) Lecture, (b) Demonstration, (c) Discussion methods: (i) Group discussion, (ii) Panel discussion, (iii) Symposium, (iv) Workshop, (v) Conference and seminar, (vi) Role play

C. **Mass approach:** (i) Television, (ii) Radio, (iii) Newspaper, (iv) Printed material, (v) Direct mailing, (vi) Posters, (vii) Folk methods and (viii) Health museum and exhibitions etc.

D. **Traditional or Folk media**

Q2a. Describe channels of communication. *(WBUHS, 2009; SMU, 2014; MU, 2019)*

Ans: **Channels of communication:** Channel is implied as the physical bridges or the media of communication between the sender and the receiver. The total communication is based on—interpersonal communication, group and mass communication/education.

Q2b. Interpersonal communication is better in behavior change than mass media for advocacy purpose—explain. *(WBUHS, 2013, 2019; BNMUB, 2011)* **Or Role of interpersonal communication in behavior change.** *(WBUHS, 2023; TRIU, 2023, 2024; KIMS, 2023; AKUB, 2022; DU, 2012)*

Ans: Interpersonal communication is more persuasive and effective than any other method of communication like mass media. Interpersonal communication is particularly important in influencing the decision of undecided persons. The superiority of interpersonal communication over mass media for creation of motivational effect has been documented. Being one way channel of communication, **mass media** carry message only from the center to periphery, feedback mechanisms are poorly organized, which is present in interpersonal communication. Being impersonal media, mass media are usually not effective in changing established mode of behavior. Interpersonal communication is also more effective in confidential issues like HIV, adolescent health problems. For these purposes, interpersonal communication is more effective than mass media.

Merits: It occurs in most friendly manner. It is most interactive and participatory. Message passes directly from source to receiver.

Demerits: Coverage is minimal and time-consuming activity.

Q3. Group discussion is an effective approach of communication.
(WBUHS, 2022; BNMUB, 2014; ABKUB, 2005, 2023; RGUHS, 2010, 2013; TDMGRMU, 2009; SAMU, 2007; KIMS, 2013; SSUHSA, 2010, 2024; DU, 2014; SMU, 2014)

Ans: A group is an **"aggregation of people interacting in a face-to-face situation."** Group discussion permits the individuals to learn by freely exchanging their knowledge, ideas and opinions. Group discussion provides a wide interaction among members than is possible with other methods. For effective group discussion, **the group should comprise not less than 6 and not more than 12 members.** The participants are all seated in a circle, so that each is fully visible to all the others. There should be a group leader, who performs the following roles—initiates the subject, helps the discussion in the proper manner, prevents side conversations, encourages everyone to participate and sums up the discussion at the end. If the discussion goes well, the group may arrive at decision, which no individual member would have been able to make alone. The recorder prepares a report on the issues discussed and agreements reached.

In a group discussion, member should **observe the following rules**:

- Express ideas clearly and concisely.
- Listen to what others say.
- Do not interrupt, when others are speaking.
- Make only relevant remarks.
- Accept criticism gracefully.
- Help to reach conclusions.

A well conducted group discussion **(Fig. 4.1)** with adequate resources is very effective in reaching decisions, based on the ideas of all people. The decision taken by the group tends to be adopted more readily than in situations where the decision is a solitary one. Thus, the group acceptance has a binding effect on the individual member to translate their acceptance into action.

In such a way, group discussion is an effective way of health communication.

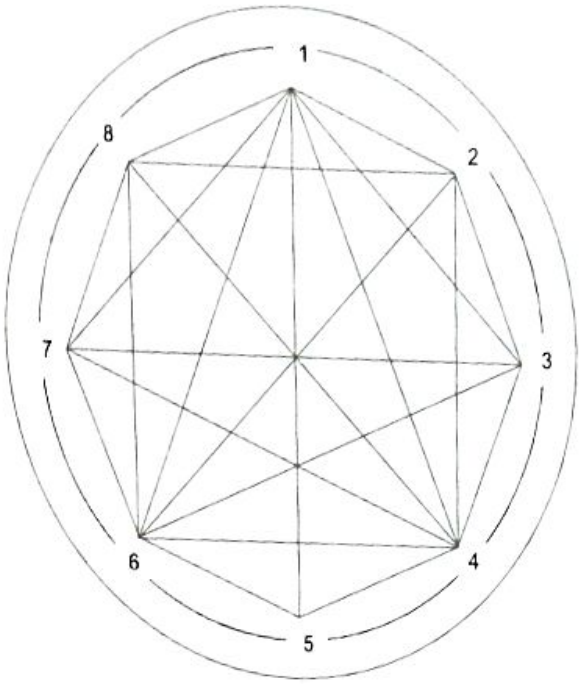


Fig. 4.1: An effective group discussion.

Q4. What is focus group discussion (FGD)? *(AKUB, 2022; SMU, 2012; RGUHS, 2024)*

Ans: Focus group discussion (FDG) is one of the method used in qualitative research. These are open-ended interviews, but instead of individuals, a small group of people who discuss a certain topic amongst themselves. **Usually, 6 to 8 participants**, who are a homogeneous group, which means they are supposed to be similar in terms of various characteristics, like age or gender or socioeconomic status or education, occupation thus the discussion goes on in a more cohesive manner.

Usually, in a focus group discussion having a **moderator**, who moderates the whole discussion and another individual who works as a **note taker** in order to take down the notes that are being discussed. Video or audio recordings could be used in FDG for further analysis.

FDG gives us a lot of rich information from a lot many more participants in **smaller time**. It helps us to generate ideas because we have a group of people. It helps to identify problems and define goals. Many a times, depending on what you want, if you want to understand local terminologies and the vocabularies then these focus groups are a good way to understand these issues.

Q5. What is panel discussion? *(RGUHS, 2010, 2014; SMU, 2015; RUJH, 2009; PBDSUHSH, 2015; ABKUB, 2023; VNSGUS, 2023)*

Ans: It is a setting where 4–8 qualified people talk about the topic, sit and discuss a given problem or the topic in front of a large audience or group.

Procedure:

- **The panel comprises, a chairman or moderator and from 4 to 8 speakers.**
- The chairman opens the meeting, welcomes the group and introduces the panel speakers.
- He introduces the topic briefly and invites the panel speakers to present their points of view.
- There is no specific agenda, no order of speaking and no set speeches.
- After the main aspects of subject are explored by panel speakers, the audience are invited to take part.
- The discussion should be spontaneous and natural.
- The members on the panel may have a preliminary meeting, prepare the material on the subject and decided upon the method and plan of presentation if they are unacquainted with this method.

Merits:
- Provides views from different speakers thus help to arrive at a solution which will be acceptable to all.
- Audience is involver actively
- Flexible, spontaneous
- Helps to understand various perspectives.

Demerits:
- Success of panel discussion depends upon the chairman as he has to keep the discussion going and develop the train of thought.
- Needs a thorough planning and preparation in advance.
- Audience needs to experienced.

Significance: Panel discussion can be an extremely effective method of education, provided it is property planned and guided.

Q6. Describe symposium. *(KIMS, 2014; RGUHS, 2012, 2015; GOAU, 2022)*

Ans: A symposium is a series of speeches on a selected subject.

Procedure:
- Each person or expert presents an aspect of the subject briefly.
- There is no discussion among the symposium members like panel discussion.
- At the end, the audience may raise questions.
- The chairman makes a comprehensive summary at the end of the entire session.

Merits:
- Transfers concise information to audience at one time
- Audience remains alert
- Analysis of different aspects of a topic at one time
- Good tool for integrated teaching

Demerits:
- There is no discussion among the members of symposium
- It requires long-term preparation and time
- Cannot be conducted frequently

Q6a. Mass communication (Radio, Television, Print media, Newspapers).

Ans: **Merits:** These media communicate masses and cover a wide geographical area and population in short span of time. Commercialization of media by providing audio tapes and video tapes for self-learning and learning at family level.

Demerits: It is a one-way communication.

Q6b. Folk media as a tool of health education. *(VBUJH, 2023)*

Ans: Every community has its own network of traditional or folk media such as folk dances, singing, dramas. Examples: Nautanki in Uttar Pradesh, Burrakatha in Andhra Pradesh and Harikatha in western India. Besides, informal group gatherings, caste or religious meetings.

These are important channels of communication close to the cultural values of rural population. They have been the principal instruments of preserving the cultural heritage. Health messages may be communicated through these folk media.

Q6c. Workshop. *(RUJH, 2023; VBUJH, 2023)*

Ans: Workshop is a novel experiment in the field of education. It consists of a series of meetings, usually four or more, with emphasis on individual work, within the group, with the help of consultants and resource

personnel. It may be divided into small groups and each group will choose a chairman and a recorder. The individual work, solve a part of the problem through their personal effort with the help of consultants, contribute to group work and group discussion and leave the workshop with a plan of action on the problem. Learning takes place in a friendly, happy and democratic atmosphere, under expert guidance. The workshop provides opportunities for each participant to improve his/her effectiveness as a professional worker.

Q7. What are the essentials of a good communication process (components)? Describe the characteristics of a good message for health communication. *(WBUHS, 2018, 2022, 2023; GNSUB, 2022, 2023; BNMUB, 2013; GITAMAP, 2023; RGUHS, 2012, 2013, 2014; TRIU, 2012, 2023; SAMU, 2011, 2015; TDMGRMU, 2008, 2015; KIMS, 2016, 2017, 2023; SMU, 2011, 2013; ABKUB, 2018; MU, 2019; RUJH, 2023; SSUHSA, 2023)*

Ans: Essentials of a good communication are as follows:

- **Sender (source)**
- **Receiver (audience)**
- **Message (content)**
- **Channel (medium)**
- **Feedback (effect)**

Sender: The sender is the originator of message. To be an effective communicator, he must know his objectives, his audience and their interests and needs, his message, channel of communication and his professional abilities and limitation.

Receiver: All communications must have an audience. This may be a single person or group of people. Without the audience, communication is nothing more than mere noise. The audience may be of two types—controlled and uncontrolled. A controlled audience is one which is held together by a common interest. It is a homogeneous group. An uncontrolled or free audience is one which has gathered together from the motives of curiosity. The more homogeneous the audience, the greater are the chances of an effective communication.

Message: A message is the information, which communicator transmits to his audience to receive, understand, accept, act upon. It may be in the form of words, pictures, signs.

A good message must be:

- In line with the objectives
- Meaningful
- Based on felt needs
- Clear and understandable
- Specific and accurate
- Timely and adequate
- Fitting the audience
- Interesting
- Culturally and socially acceptable

Channels of communication: By channel is implied the physical bridges or the media of communication between the sender and the receiver. The total communication is based on interpersonal communication, mass media and traditional or folk media.

Feedback: It is the flow of information from the audience to the sender. It is the reaction of the audience to the message. If the message is not clear or not acceptable, the audience may reject it immediately. The feedback thus provides the sender to modify his message and render it acceptable. In interpersonal communication, feedback is immediate. In mass communication, it takes some time to get feedback.

Q8. Describe in brief the different types of communication. *(GNSUB, 2022; BNMUB, 2013, 2016; ABKUB, 2023; SAMU, 2015, 2022; KIMS, 2016, 2017; SMU, 2011, 2013; SSUHSA, 2015)*

Ans: Different types of communication are discussed below:

One-way communication (didactic method): The flow of communication is one way from communicator to the audience. The familiar example is the lecture in the classroom. The drawbacks of didactic methods are, knowledge is imposed; learning is authoritative; audience participation is little; no feedback and this does not influence human behavior.

Two-way communication (socratic method): In this method, both the communicator and audience take part. The audience may raise questions and add their own information, ideas, opinion to the subject. The process of learning is active and more likely to influence behavior than one way communication.

Verbal communication: The traditional way of communication has been by word of mouth. The advents of written and printed matters are of comparatively recent origin. Direct verbal communication by word of mouth may be loaded with hidden meanings. It is persuasive. Non-direct or written communication may not be as persuasive as the spoken word.

Nonverbal communication/silence is a form of communication. *(AKUB, 2022)*
It includes a whole range of bodily movements, postures, gestures, facial expression (smile, raised eye brows, frown, staring, gazing etc.) It can speak louder than words.

Formal and informal communication: Communication has been classified into formal (follows lines of authority) and informal (grapevine) communication. Informal network exists in all organizations. The informal channel may be more active, if the formal channel does not cater to the information needs.

Visual communication: The visual forms of communication comprise charts and graphs, pictograms, tables, map, poster, etc.

Telecommunication and internet: Telecommunication is the process of communicating over distance using electromagnetic instruments designed for the purpose. Radio, TV, internet, etc., are mass communication media, while telephone, telegraph are known as point-to-point communication system. The point-to-point systems are closer to interpersonal communication.

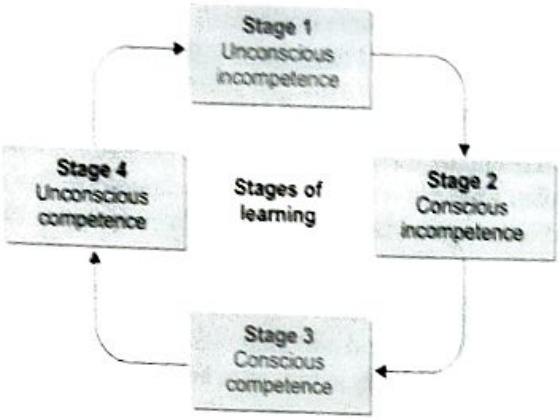
Q8b. Different audio-visual aids in health communication. *(GOAU, 2023)*

Ans: No health education can be effective without audiovisual aids. **Modern science has made available an endless array of audiovisual aids which can be classified into three groups.**

1. **Auditory aids:** Radio, tape-recorder, microphones, amplifiers, earphones, etc.
2. **Visual aids:**
   a. *Not requiring perfection:* Chalkboard, leaflets, posters, charts, flannelgraph, exhibits, models, specimens, etc.
   b. *Requiring perfection:* Slides and film strips.
3. **Combined A-V aids:** Television, sound films (Cinema) and slide-tape combination.

Q8c. Enumerate stages of learning. *(GNSUB, 2023)*

Ans. The stages of learning reflect how learners process and assimilate information:
Stage 1: Unconscious incompetence (ignorance)
Stage 2: Conscious incompetence (awareness)
Stage 3: Conscious competence (learning)
Stage 4: Unconscious competence (mastery)



The seven-step learning journey supports students to sequentially (1) excavate; (2) absorb; (3) experience; (4) observe; (5) deepen; (6) exchange; and (7) consolidate

CM4.1: Social marketing program; a method of health education.

Q9. What is social marketing? *(RGUHS, 2013; TDMGRMU, 2010; RUHS, 2008)*

Ans: Social marketing is the application of commercial marketing tools and principles to design, implementation and evaluation for health and social behavior change programs. Products are sold in the market in lesser prices, available at doorstep shop.

Aim: Primary aim of social marketing is "social good".

Components:

- **Emphasis on selling a product:**
  - Includes sale of some socially beneficial products like condoms, oral pills, ORS, etc.
  - These products are subsidized to ensure that consumer cost is low enough to reach those who are unable to pay commercial prizes.
  - Actual sale of product ensures consumer motivation, increasing internal efficiency, stimulating entrepreneurial instincts of program managers, contributing towards cost recovery and potential for long term self-sufficiency.
- **Emphasis on selling an idea:**
  - Also called as social advertising
  - Includes promotion of socially beneficial idea and practices like breastfeeding, immunization, use of helmets, stop smoking, etc.
  - There is no object to sell, no transfer of money.
  - Consists of traditional educational strategy to reflect a consumer orientation in a marketing context.

Basic elements (4 P's)

- **Product:**
  - Material things, ideas, beliefs and way of thinking.
  - For example, oral rehydration solution, breastfeeding, vaccines, etc.
- **Price:** Can be monetary or physical/psychological effort/sacrifice involved as a consequence of adoption of product.
- **Promotion:** Includes several means, including advertisement, communications.
- **Place:** Where product is available and depends upon an adequate distribution and supply system.

Important social marketing programs:

- Promotion of ORT
- Social marketing of contraceptives (Family Planning)

- About 13 countries including India are selling condoms, pills and other family supplies at subsidized prices through retail stores.
- India has been promoting Nirodh Condom program since 1967 and oral contraceptives (Mala-D) since 1987.

Advantages:

- Commercial distribution network makes contraceptives available in places where other health programs do not reach.
- Retail outlets are far more convenient as they are usually open for longer hours, are regularly visited by consumers, avoid embarrassment, etc.
- It appears to those who cannot afford to pay full commercial price.

CM4.3: Demonstrate and describe the steps in planning, organizing, implementation and evaluation of health promotion and education programs.

Q10. Explain objectives of health education. *(BNMUB, 2010; SMU, 2010)*

Ans: Health education is a process of dissemination of knowledge aimed at encouraging the people to want to be healthy, to know how to stay healthy, to do what they can individually and collectively practice, to maintain health and to seek help when needed. The Alma-Ata Declaration adopted in 1978 provides a useful basis for formulating the aims and objectives of health education.

Objectives of health education:

- To encourage the people to adopt and sustain health promoting lifestyle and practices.
- To promote the proper use of health services available to them.
- To arouse interest, provide new knowledge, improve skills and change attitude in making rational decisions to solve their own problems.
- To stimulate individual and community self-reliance and participation to achieve health development through individual and community involvement at every steps from identifying problems to solving them.

Q11. Principles of health education. *(YSRUHSAP, 2023)*

- Credibility
- Interest
- Participation
- Motivation
- Comprehension
- Reinforcement
- Learning by doing
- Known to unknown
- Setting an example
- Good human relation
- Feedback
- Leaders

Steps of planning, organizing and implementing education program:

Planning: The objectives must be defined—what behavior needs to be changed and within what period?

Example: To increase the acceptance of condom from current level of 5.6% to 12% within a span of 4 years could be the objective.

Need assessment: Assess the communication needs of individuals, family and community in the area related to knowledge, attitudes, beliefs and practices on the basis of specific problem. This can be done by contracting the clients through routine visits and annual survey of eligible couples and meeting with the mother/caregivers in immunization session/mothers meeting.

Define target audience and understand their concern: Identify the families, which need the help most. Weaker section of community or those families having the problems. Families having pregnant women, infant and young children could be the target audience. Audience could be assessed on the basis on their economic status, caste and literacy status.

Message: It should be specific. It should generate awareness and also lead to behavior change. If the message on the small family then all education materials should made available and **GATHER** approach should be used for counseling of clients.

Select right channel to reach the audience: Appropriate channel of communication like television or radio, print-media should be used. It should reach to the maximum number of clients and intention is to maximum coverage.

Tracking clients to sustain behavior change: After messages have been given, these must be repeated. Sustained contacts with client build a mutual trust, increase understanding and generate confidence.

Steps in evaluation: Finally, we need to evaluate the results of communication. The evaluation is done by the workers themselves during their home visits and contacts with the audience or clients.

- The knowledge can be evaluated by asking standard questions about a specific problem.
- The feeling (attitude) can be evaluated by Likert scale—a scale measuring the degree to which people agree or disagree with a statement.
  Example: Spacing births 2 years apart is good for the health of mother and survival of child.
  3-point scale: Agree _____ neutral _____ disagree
  5-point scale: Strongly agree _____ agree _____ neutral _____ disagree _____ strongly disagree.
- **Behavior change:** Practices can be evaluated by observations like practice of washing hands, nail cutting, cord cutting, cooking food and feeding practices.

CM4.2: Describe the concept and method of health counseling.

Q12. **There is no scope of giving advice in counseling-explain.** *(WBUHS, 2021)*/**Counseling is a form of "Empowered decision-making"—explain.** *(AKUB, 2022; TRIU, 2023)*

Ans. **Definition of counseling:** It is a face-to-face communication by which you help the person to make decision or solve a problem. It helps people to understand themselves better in terms of their own needs, strengths, limitations and resources they can avail of. It brings about a change through supportive relationship aiming to make client independent through the interpersonal contact along with the opportunity to ask questions and seeking help.

From the above definition we able to get the answer of the questions.

Q13. **Describe health education and counseling.** *(BNMUB, 2008; KIMS, 2015, 2019; BUMP, 2012; RUJH, 2009; SAMU, 2009; SMU, 2009)*

Ans:

Health education	*Counseling*
Health education is a process aimed at encouraging people to want to be healthy, to know how to stay healthy, to do what they can individually and collectively to maintain health.	Counseling is a face-to-face communication, by which counselor helps the client to make decision or solve a problem.
It gives useful information and raising awareness to audience.	It tries to change the established mode of behavior.
It can be given through interpersonal communication, mass media or group approaches.	It is mainly given through interpersonal communication, confidentiality is an essential perquisite of counseling
In case of sensitive issues, health education alone is not very helpful.	In case of sensitive issues, counseling is more useful than health education.

Concept of counseling: Counseling is one person helping another as they talk person to person. Through counseling, you help clients make informed choices that suit them. For example, some clients are choosing family planning methods, other clients are deciding how to avoid sexually transmitted diseases. Young clients (adolescents) may be choosing whether to delay sexual activity. All these clients make better decisions with your help.

Q14. GATHER approach. *(TRIU, 2023; VBUHI, 2023)*

Ans. Considering the facts, for counseling the clients on contraceptive use GATHER method is practiced.

G—Greet the clients
A—Ask the client/s about themselves
T—Tell clients about FP methods
H—Help clients choose a method
E—Explain how to use a method
R—Return for follow up

Greet the clients:

- As soon as you meet the clients, give them your full attention.
- Be polite, greet them, introduce yourself and offer them seats.
- Ask how you can help.

Ask the client/s about them:

Ask clients about their needs, wants, any doubts, concerns, questions they have about family planning. If the client is new, obtain the history.

- Age
- Marital status
- Number of pregnancies
- Number of births
- Number of living children
- FP methods use presently and past
- Basic medical information

Tell clients about FP methods:

- Tell your clients which methods are available and where it is available
- Ask your clients which methods interest them.
- Ask your clients what they know about the methods that interest them, if the information is wrong, gently correct the mistake.
- Briefly describe each method:
  - How it works
  - Advantages and benefits
  - Disadvantages and side effects

Help clients choose a method:

- To help clients choose, ask them about their plan and family situation. What is the family situation now?
- Ask clients what her/his sexual partner wants and what methods would he or she like to use.
- Some methods are not safe for some clients. When method is not safe, tell the client and explain clearly. Then help the client choose another method.
- What method have you decided to use?

Explain how to use a method:

- After the client has chosen the method, give him or her supplies, if appropriate.
- If cannot be given immediately, tell how, when and where it will be provided.
- For permanent method clients have to sign a consent form. Printed material about the method is allowed to take home.

Return for follow up:

At the follow up visit:

- If he or she still is using the method
- If any problem after using the method
- If any side effect (minor or severe) has been observed, let her/him describe.
- Ask how the client is using the method.
- If the client has any questions, allow her/him to ask.

Q15. Discuss the role of (pretest and post-test) counseling in controlling HIV/AIDS, write on VCTC/ICTC and sentinel surveillance in prevention of HIV/AIDS. *(WBUHS, 2010; ABKUB, 2006, 2009; SAMU, 2004; BNMUB, 2006; RGUHS, 2008; NU, 2015; KIMS, 2019)*

Ans: Counseling: Counseling is face-to-face communication by which counselor can help the person/client make decisions and act on them. Its main is to solving problem.

The counselor should be skillful, communicative, knowledgeable, cooperative, empathic, maintaining confidentiality, good listener, non-commanding attitude.

Pre and post-test counseling playing an important role for prevention of HIV/AIDS.

Objectives: Counseling before test (pretest) prepares the clients for undergoing test and changing his/her high-risk behavior whereas counseling after the test result (post-test) prepares the client to understand the meaning of positive and negative test.

The meaning of VCTC is Voluntary Counseling and Testing Center. This involves increasing availability and demand for voluntary testing, training of grass root level healthcare workers in HIV/AIDS counseling and providing counseling services through all blood banks in India and through STI clinics. VCTC established in each district hospitals of the all states and few designated sub-divisional hospitals which also act as designated STI/RTI Center (DSRC). This services are also being conducted in private run clinics and NGOs enlisted by State AIDS Prevention and Control Society (SAPCS).

Apart from this above said activities the center also provides counseling on Prevention of Parent-To-Child Transmission (PPTCT) of HIV/AIDS and also counseled TB patient on HIV/AIDS. Presently VCT centers are remodeled as a hub to deliver integrated services to all clients under one umbrella and renamed as "Integrated Counseling and Testing Centers" (ICTC).

SHORT NOTES AND RELEVANT QUESTIONS

Q16. Describe kinds of interview. *(MUHS, 2019)*

Ans: Kind of interview are as follows:

- Personal interview
- Through telephone
- Mailing of questionnaire
- Through schedule

It depends upon the study technique, the tools may be questionnaire/schedule.

Questionnaire/schedule may be structured/unstructured/semistructured.

Structured questionnaire mostly used for quantitative studies. Structured questionnaire are those questionnaire in which there are definite, concrete and predetermined questions. The questions are prepared with exactly same warding for all respondents and also standardized. The form of question may either **closed** (i.e., the type yes/no or true/false). It may be **open type** (i.e., inviting free response) but should be stated in advance and not constructed during questioning. Structured questionnaire has a fixed alternatives like multiple choice question (MCQ). Multiple choice or **closed questions** have the advantages of easy handling simple to answer, quick and relatively inexpensive to analysis. But main drawbacks of fixed alternative

questions is that of "putting answers in people's mouths", i.e., they may force a statement of option on an issue about which the respondents does not in fact have any option.

On the other hand **open ended questions** are designed to permit a free response from the respondent rather than one limited to certain stated alternatives are considered appropriate. Respondent's can reply in their own wards. It is more difficult to handle, raising problems of interpretation and also having comparability and interviewer bias.

Unstructured questionnaire is open ended questions and the respondents are not restricted to a fixed choice. It contains open-ended questions exclusively or majority. Here, the interviewer is provided with a general guide on the type of information to be obtained, but the exact question formation is largely his own responsibility and response are noted down in the respondent's own wards as far as possible, in some instance tape recorder could be used.

Semistructured questionnaire comprise a mixture of closed and open-ended questions. It is a type of interview in which the interviewer asks only a few predefined questions while the rest of the questions are not planned in advance arise spontaneously in a free-flowing conversation. They are commonly used where there is a need to accommodate a large range of different responses from respondents. Use of semi-structured questionnaires enables a mix of qualitative and quantitative information to be gathered. They can be administered over the telephone or face-to-face.

Q17. What is demonstration? *(MUHS, 2019)*

Ans: A demonstration is basically a presentation to show how to perform a skill or procedure. Principles of demonstration are:
(a) Arousing interest by role playing, (b) Uphold the technique of "seeing is believing" and "learning by doing" and (c) Can bring desirable changes in the behavior pertaining to the use of new practice. It is having a high educational value and means of communication for implementation of different programs like installation of hand pump, construction of sanitary latrine, demonstration of oral rehydration salt, etc. Clinical teaching is based on demonstration.

Q18. Telemedicine is now an important field of medical communication. *(WBUHS, 2019)*

Ans: **Telemedicine** refers to the practice of caring for patients remotely when the provider and patient are not physically present with each other. Modern technology has enabled doctors to consult patients by using HIPAA compliant video-conferencing tools. Get guidance from clinical topics related to **telemedicine** security and **HIPAA** (Health Insurance Portability and Accountability Act of 1996).

It is a important field of medical communication due to following reasons:
- Relatively reduce the costs and time patients in respect to transportation
- Easy to access in remote areas
- Improves communication between health providers separated by distance
- Continuing medical education and clinical research
- Important for critical care patient where transfer/referral is not possible
- A tool for public awareness also for disaster management
- Once established it can bring expertise to medical practice
- Used for robotic surgery
- Improved rehabilitation services in remote areas.

Q19. Briefly mention the common barriers of communication. *(WBUHS, 2018, 2021, 2023; ABKUB, 2018, 2022, 2023; MGUB, 2022, 2024; AFUH, 2022, 2023; BNMUB, 2013; GITAMAP; RGUHS, 2013, 2014; TRIU, 2012; SAMU, 2011, 2015; TDMGRMU, 2015; KIMS, 2017, 2019, 2021, 2024; SMU, 2011, 2013; MU, 2019; SSUHSA, 2023; RUJH, 2023; DBRAUA, 2024)*

Ans: Health education may often fail due to communication barriers between the educator and community.

The probable barriers of communication are:

Physiological	*Psychological*	*Environmental*	*Cultural*
Mainly concerned with the person's ability to give good health education and to make the message palatable to the audience **Examples:** Difficulty in listening, visualization, speaking, expressing, habits, stress and strain	• Main barrier between the health educator and audience. • To become a good health educator, the psychological barriers must be broken between the audience and communicator for which the audience should feel that the health educator is also one among them. • The emotional barrier between the communicator and the audience is eliminated. **Examples:** Mental tension, instability, lack of concentration, emotional disturbance, language difficulties	Common barriers in giving health education to masses or groups. **Examples:** Over-crowing, poor listening, noise, thermal discomfort, bad odors, ill maintained channels of communication	• A health educator must understand the cultural background of the audience • Health educator should not hurt the sentiments of the people. **Examples:** Poor knowledge of customs, practices, attitudes, habits, beliefs, confidence, level of understanding

Q20. What is attitude? *(BNMUB, 202*

Ans: **Attitudes** are acquired characteristics of an individual. They are more or less permanent ways of behaving. An attitude includes basic **three components**:

1. Cognitive or knowledge element.
2. Affective or feeling element.
3. A tendency to action.

An attitude has been defined as a relatively enduring organization of beliefs around an object, subject or concept which predisposes one to respond in some preferential manner. Attitudes are acquired by social interaction, e.g., attitudes towards persons, things, situations, issues. It has been seen that attitudes are caught, not taught. Once formed, attitudes are difficult to change. The responsibility to develop healthy attitude devolves upon parents, teachers, religious leaders and elder. Our success or failure in life depends upon our attitudes. Social psychology is largely a study of attitude. In recent years, attitude surveys and attitude measurement have been widely used by the psychologists and health professionals.

Q21. What is role play? *(BNMUB, 2002; ABKUB, 2007; RGUHS, 2004, 200*

Ans: Role play or socio-drama is based on assumption that many values in a situation cannot be expressed in words, and the communication can be more effective, if the situation is dramatized by the group. The group members who take part in the socio-drama enact their roles as they have observed or experienced them. The audience is not passive but actually concerned with drama. They are supposed to pay sympathetic attention to what is going on, suggest alternative solutions at the request of leader and if requested, come up and take an active part by demonstrating how they feel a particular role should be handled. The size of the group thought to be best at about 25. Role playing is a useful technique to use in providing discussion of problems of human relationship. It is a particularly useful educational device for school children. Role playing is followed by a discussion of the problem.

Q22. Health education is not a health propaganda. Justify with example. *(WBUHS, 2008, 2024 BNMUB, 2022; ABKUB, 2017, 2024; RGUHS, 2014; TDMGRMU, 2016 NIMSUR, 2015; NU, 2017; KIMS, 2023, 2024; DBRAUA, 2024*

Ans: Health education differs from health propaganda in following aspects. From the comparison of health education and health propaganda, it can be justified that health education is not synonymous to health propaganda.

Health education	Health propaganda
Knowledge and skills actively acquired	Knowledge instilled in the mind of the people
Makes people think for themselves	Prevents or discourages thinking by readymade slogans
Disciplines primitive desires	Arouses and stimulates primitive desires
Develops reflective behavior	Develops reflexive behavior
Appeals to reason	Appeals to emotion
Develops individuality, personality and self-expression	Develops a standard pattern of attitudes and behavior according to the mold used
Knowledge acquired through self-reliant activity	Knowledge is spoon-fed and passively received
The process is behavior-centered—aims at developing favorable attitudes, habits and skills	The process is information centered—no change of attitude or behavior designed

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Which of the following is not a one-way communication?** *(ABKUB, 2019; AKUB, 2024)*
   a. Symposium b. Lecture c. Group discussion d. Stage show

2. **All of the following are the type of audio-visual aids, *except*:** *(ABKUB, 2018)*
   a. Television b. Cinema c. Flannel graph d. Slide tape combination

3. **Which of the following is not a group approach for health communication?** *(ABKUB, 2021)*
   a. Lecture b. Symposium c. Television d. Seminar

4. **Panel discussion can be defined as:** *(ABKUB, 2016; WBUHS, 2023)*
   a. Series of speeches
   b. Discussion by 4-8 qualified persons
   c. Groups describing individual experiences
   d. Stage-wise formatted teaching

5. **To develop effective AIDS control strategy, experts from all over the world are invited to devise the plan after relevant discussion. What name is given to this method?** *(ABKUB, 2020)*
   a. Seminar b. Group discussion c. Symposium d. Panel discussion

6. **Following are used in planning of health education, *except*:** *(VKSUAB, 2021)*
   a. Cover felt needs b. Using simple words c. Catchy slogans d. Ensuring participation

7. **Which of the following method in health communication is useful in control of scabies?** *(YSRUHSAP, 2023)*
   a. Lecture b. Group discussion c. Demonstration d. Role play

8. **Which of the following cases falls under regulatory approach (managed prevention) of health education?** *(SSUHSA, 2023)*
   a. Tobacco cessation campaign
   b. Mandatory use of seat belt in vehicle
   c. Safe drinking water campaign
   d. Community participation

9. **Health education is the responsibility of:** *(RUJH, 2023; VBUJH, 2023)*
   a. Health educationalist
   b. Doctor
   c. Paramedical staff
   d. Every health worker
   e. Community nurse

10. **Swasthya-Sathi scheme is an example of:** *(WBUHS, 2024: AKUB, 2024)*
    a. Social assistance b. Social marketing c. Social insurance d. Social participation

11. **All are different types of learning domains, *except*:** *(KIMS, 2024)*
    a. Cognitive b. Affective c. Psychomotor d. Psychosocial

12. Communication process includes which components: *(DBRAUA, 2024)*
a. Sender b. Receiver c. Message d. All of the above

13. Which of the following is a 2-way communication? *(SSUHSA, 2024)*
a. Group discussion b. Panel discussion c. Symposium d. All of the above

14. Which of the following is/are didactic methods of health communication? *(RUJH, 2024)*
a. Ground discussion b. Workshop c. Panel discussion d. Lecture

15. All are true about panel discussion, *except*: *(WBUHS, 2023; VNSGUS, 2023)*
a. Panel of 4–8 experts discuss a health topic
b. Audience is present
c. Specific order, set speeches
d. Audience can take part

16. Diarrhea cases among children of an urban slum are on a rise. Almost all the mothers are illiterate and belong to lower socioeconomic class. It seems difficult to make them understand the use of ORS. What method can provide the best solution in this scenario? *(VNSGUS, 2023)*
a. Role play
b. Poster competition
c. Radio program
d. Lectures
e. TV commercials

17. The best method of teaching rural population about ORS is: *(WBUHS, 2023)*
a. Demonstration b. Role play c. Lecture d. Flash card

18. GALPAC is a model used for: *(WBUHS, 2024)*
a. Counseling
b. Medicolegal documentation
c Doctor patient communication
d. Unethical conduct

19. Study of physical, social and cultural history of man is known as: *(AKUB, 2024)*
a. Social science b. Anthropology c. Acculturation d. Sociology

Answers:

1.	c	**2.**	c	**3.**	c	**4.**	b	**5.**	a	**6.**	c	**7.**	b	**8.**	d	**9.**	d	**10.**	c
11.	d	**12.**	d	**13.**	d	**14.**	d	**15.**	c	**16.**	a	**17.**	a	**18.**	a	**19.**	b		

FILL IN THE BLANKS WITH APPROPRIATE WORD(S)

1. IEC means _____ *(SAMU, 2015)*
2. The Lecture method in classrooms in an example of _____ communication *(VKSUAB, 2013)*
3. Radio, TV and newspapers are known as _____
4. The type of discussion where a group of 4–8 qualified experts discuss a topic in front of an audience is called _____ *(KIMS, 2019)*
5. For effective group discussion, the group should comprise not less than _____ and not more than _____ members. *(KIMS, 2019)*

Answers:

1. Information, Education and Communication
2. One way
3. Mass media
4. Panel Discussion
5. 6 (Six); 12 (Twelve)

TRUE/FALSE

1. Lecture is a one way of communication. *(SAMU, 2015)*
2. GATHER approach is useful for counseling. *(MU, 2024)*

Answers:

1. True
2. True

CHAPTER

5

Nutrition

QNS 1: Describe the common sources of various nutrients and special nutritional requirements according to age, sex, activity, physiological conditions.

Q1. Common sources of various nutrients:

Ans: Examples of food groups are tabulated in Table 5.1(a) and recommended dietary allowance (RDA) of Indians as per ICMR-2020 showed in Table 5.1(b).

Table 5.1(a): Examples of food groups.

Food groups	Examples
Cereals	Rice, wheat and millets
Pulse	Bengal gram, red gram, khesari dal, black gram, green gram, lentil
Nuts and oil seeds	Ground nuts, almond
Green leafy vegetables	Palak, amaranth, drumstick leaves, mustard and colocasia leaves, radish
Root vegetables	Potato, carrot
Other vegetables	Brinjals, ladies finger, beans, pumpkins
Fruits	Papaya, banana, dates, guava
Dietary fibers	Whole grain cereals, pulses, green leafy vegetables and fruits
Milk and milk products	Cow's and buffalo's milk, curd
Sugar and Jaggery	Sugarcane, plain sugar
Flesh foods	Meat, fish
Eggs	Eggs (chicken), duck egg
Condiments and spices	Green chillies, turmeric
Salt	Iodized salt

Table 5.1(b): Recommended dietary allowance (RDA) of Indians as per ICMR-2020.

Group	Category/Age	Body weight (kg)	Energy (kcal/day)	Protein (gr/day)	Calcium (mg/day)	Iron (mg/d)	Folate (µg/d)	Vit A (µg/d)	Vit C (IU/d)
Men	Sedentary	65	2110	54	1000	19	300	1000	80
	Moderate		2710						
	Heavy		3470						
Women	Sedentary	55	1660	46	1000	29	220	840	65
	Moderate		2130						
	Heavy		2720						
	Pregnant woman	65	1660+350	55.5 * 68.0 **	1000	27	570	900	80
	Lactation 0–6 months		1660+600	63	1200	23	330	950	115
	Lactation 7–12 months		1660+520	59			330		

Cont...

Contd...

Group	Category/Age	Body weight (kg)	Energy (kcal/day)	Protein (gr/day)	Calcium (mg/day)	Iron (mg/d)	Folate (µg/d)	Vit A (µg/d)	Vit C (IU/d)
Boys	16–18 years	64.4	3320	55	1050	26	340	1000	85
Girls	16–18 years	55.7	2500	46	1050	32	270	860	70
Boys	13–15 years	50.5	2860	45	1000	22	285	930	70
Girls	13–15 years	49.6	2400	43	1000	30	245	890	65
Boys	10–12 years	34.9	2220	32	850	16	220	770	55
Girls	10–12 years	36.4	2060	33	850	28	225	790	50
Children	7–9 years	25.3	1700	23	650	15	170	630	45
Children	4–6 years	18.3	1360	16	550	11	135	510	35
Children	1–3 years	12.9	1010	12.5	500	8	120	390	30

Note: 1st Trimester*, 2nd Trimester**

CM5.4: Plan and recommend a suitable diet for the individuals and families based on local availability of foods and economic status, etc., in a simulated environment.

Q1a. Enumerate different methods of diet survey and methods you have adopted to assess nutritional status in a family study. *(ABKUB, 2008)*

Q1b. Enumerate different methods of diet survey. Briefly describe the method you have applied to assess the nutritional status in your "Family Program". *(WBUHS, 2017, 2019; VKSUAB, 2021; RGUHS, 2024; AKUB, 2024)*

Ans: The value of nutritional assessment status is greatly enhanced when it is supplemented by assessment of food consumption. Direct assessment of food consumption involves dietary surveys which may be household enquiries or individual food consumption survey.

A diet survey may be carried out by one of the following methods:

- **Weighment of raw foods:** This method is widely employed in India as it is practicable and it is considered accurate if carried out properly. The survey team visits the household and weighs all the good that is going to be cooked and eaten as well as that which is wasted or discarded. The duration of survey may vary from 1 to 21 days but commonly 7 (seven) days which is called **"one dietary cycle".**
- **Weighment of cooked food:** Foods should preferably be analyzed in the state in which they are normally consumed but this method is not easily acceptable among the people.
- **Oral questionnaire methods:** This method is useful in carrying out in a large number of people. Enquiries are made retrospectively about the nature and quantity of the foods eaten during the previous 24 hours or 48 hours; if it is properly carried out oral questionnaire methods can give reliable results.

The data that collected have to be translated into, (a) mean (average) intake in grams of food in terms of cereals, pulses, green leafy vegetables, roots and tubers, other vegetables, fruits, milk and milk products, flesh foods (meat, fish, and eggs), fats and oils, sugar and jiggery, nuts and oil seeds and miscellaneous food item if any, and (b) the mean intake of nutrients per adult sedentary man value in terms of **"Consumption unit (CU)".** This exercise requires the use of suitable tables of food composition. An excellent guide for carrying out the analysis is the **Indian Council of Medical Research (ICMR) Publication; "Nutritive value of Indian Foods."**

A diet survey may also include collection of data relating to dietary habits and practices. It also provides information about dietary intake patterns of specific food consumed and estimated nutrient intake. It indicates relative dietary inadequacies as judged by present standards. Such information not only valuable

Q2c. How do you assess the nutritional status of under-five children in a community?
(WBUHS, 2012; AKUB, 2022, 2023; SMU, 2012; NU, 2016; SSUHSA, 2017; AFUH, 2023)

Q2d. Discuss the methods of nutritional assessment of pre-school children in the community.
(BNMUB, 2006; RGUHS, 2008; TDMGRMU, 2011, 2016)

Q2e. How will you assess the nutritional status of a 36-month-old child attending your PHC? *(WBUHS, 2018)*

Ans: The **following methods** are adopted for carrying out the nutritional assessment in an urban slum community. Sampling is important for conducting the assessment. It must be random and representative of the community. Sample should cover all ages, both sexes along with different socioeconomic groups if applicable.

Operational methodology for the nutritional survey should be finalized in advance, like:
- Duration of survey
- Type of survey
- Study design
- Standardization of measurement technique or survey instrument

Different methods of nutritional status assessment are discussed below:

a. **Anthropometric measurements,** such as weight, height or length, skin-fold thickness, mid-arm circumference are valuable indicators of nutritional status. In young children, additional measurement, such as head and chest circumference are taken. According to anthropometric measurement nutritional status can be classified in the following ways:

Weight-for-Age Z score	*Nutritional status*
Between +2 and –2	Normal
Between –2 and –3	Moderately underweight
Below –3	Severely underweight

Advantages of anthropometric measurement:
- It can be collected by nonmedical personnel after sufficient training like ANM, AWW, ASHA, School teacher.
- If the measurements are recorded over a period of time, they reflect the pattern of growth and development within a short span of time.
  Example: Regular measurement of weight and subsequent plotting in the revised ICDS growth chart in ICDS program.

b. **Laboratory and biochemical assessment:** Different laboratory tests are conducted in nutrition surveys like hemoglobin level, RBC count, hematocrit determination, and stool for intestinal parasite. Hemoglobin level is a useful index of the overall state of the nutrition irrespective of its significance of anemia. With increasing knowledge of metabolic function of vitamins and minerals, assessment of nutritional status by clinical science has given way to more precise biochemical tests like serum retinol, serum iron, urinary iodine.

c. **Clinical examination:** It is an essential feature of all nutritional survey, and it is the simplest and most practical methods of ascertaining the nutritional status of a group of individuals. There are number of physical signs like alopecia, lusterless hair, flag sign, anemia, Bitot's spot, cheilosis, glossitis, angular stomatitis, gum bleeding, goiter, phrynoderma, hepatomegaly, calf tenderness, pedal edema, etc.

d. **Assessment of dietary intake:** Direct assessment of food consumption involves dietary surveys which may be household enquiries or individual food consumption survey. The duration of diet survey is commonly 7 days which is called one dietary cycle. A diet survey may be carried out by one of the following methods:
   - *Weighment of raw foods:* The survey team visits the household and weighs all the good that is going to be cooked and eaten as well as that which is wasted or discarded.
   - *Weighment of cooked food:* Foods should preferably be analyzed in the state in which they are normally consumed but this method is not easily acceptable among the people.

- *Oral questionnaire methods:* Enquiries are made retrospectively about the nature and quantity of the foods eaten during the previous 24 hours; if it is properly carried out oral questionnaire methods can give reliable results. A diet survey provides information about dietary intake patterns of specific food consumed and estimation of nutrient intake.

e. **Assessment of ecological factors:** Malnutrition is the end result of many interacting ecological factors. It is necessary to collect ecological information of the given community in order to make the nutritional assessment complete. A study of ecological factors comprises the following:
- *Socioeconomic factors:* Family size, occupation, income, education especially female literacy.
- *Customs:* Cultural pattern in relation to feeding practices of the children and mother.
- *Health and educational services:* Primary healthcare services, feeding and immunization program should be considered.
- *Conditioning influences:* These include parasitic, bacterial and viral infection which precipitate malnutrition like ARI, measles, diarrhea, hookworm infestation.

f. **Functional indicator:** These indices are emerging as an important class of diagnostic tools.

Examples:

System	Nutrients
Hemostasis: Prothrombin time	Vit K
Nerve function: Nerve conduction	Vit B_1 and Vit B_{12}
Dark adaptation	Vit A, zinc
Work capacity: Heart rate	Iron

g. **Vital statistics:** An analysis of vital statistics reveals morbidity and mortality data and also will identify the high- risk groups and indicate the extents of risk to the community. Data on morbidity particularly in relation to protein energy malnutrition, anemia, xerophthalmia and vitamin deficiency, endemic goiter, diarrhea, measles and parasitic infection can be value in providing additional information contributing to the nutritional status of the community. Important mortality data used for the purpose are infant mortality rate, 2nd year mortality rate, under five mortality and life expectancy.

Q2f. Considering its effect on present and future lives of children, name most important anthropometric indicator of undernutrition with justification. *(WBUHS, 2019)*
Anthropometry is an effective method for nutritional assessment in under five children. *(WBUHS, 2019)*

Ans: The most important anthropometric indicator for assessment of undernutrition is measurement weight. Measurement of weight and rate of gain in weight are best single parameter for assessing physical growth as well as undernutrition. A single weight recording only indicates the child's size (cross-section) at that moment (point of time). It does not give any impression about a child's weight is increasing, stationary or decreasing because normal variation of weight in same age evident. Therefore, repeated measurement of weight at intervals is very important. **Ideally the child's weight should be taken monthly from birth to 1 year, every 2 months during 2nd year and every 3 months from 3rd year to 5 years of age.** Since this age group is at greatest risk of growth faltering. By plotting the weight of child in growth chart and comparing with reference standards of weight of children in same age growth trend could be assessed. Serial weighing is useful to interpret the process of growth of child by using growth chart when age of the child is not known.

It is very important to note that healthy baby on an average double their birth weight by 5 months and treble it by the end of first year and quadruple by the age of 2 years.

So, considering its effect on the present and future lives of children, name most important anthropometric indicator is weight measurement.

Q2. Enumerate common nutritional problems in the community. Draw a schedule for nutritional assessment of children of a school.

(WBUHS, 2017, 2021; MGUB, 2022; GNSUB, 2022; BNMUB, 2020, 2023; VKSUAB, 2018; AFUH, 2023; AKUB, 2023; VBUJH, 2023; YSRUHSAP, 2023; KIMS, 2015, SSUHSA, 2018, 2020; SMU, 2010; MU, 2019; SAMU, 2022)

Ans: The **common nutritional problems** in our community/country are enumerated below:

- Low birth weight
- Protein energy malnutrition (PEM)
- Nutritional anemia
- Xerophthalmia
- Iodine deficiency disorder
- Endemic fluorosis
- Lathyrism

Schedule for nutritional assessment in a school

General Information:

Serial No. **Date:**

Name: **Age:** **Sex:**

Class: **Section:**

Address:

Village: **P.O.:** **Block:** **District:**

Clinical:

- **General appearance:** Normal/thin built/sicky
- **Hair:** Normal/lack of luster/dyspigmented/thin and sparse/easily pluckable/flag sign
- **Face:** Diffuse pigmentation/nasolabial dyssebacia/moon face
- **Eyes:** Conjunctiva—normal/dry on exposure for 1/2 min/dry and wrinkled/Bitot's spots/brown pigmentation/ angular conjunctivitis/pale conjunctiva. Cornea—normal/dryness/hazy or opaque
- **Lips:** Normal/angular stomatitis/cheilosis
- **Tongue:** Normal/pale and flabby/red and raw/fissured/geographic
- **Teeth:** Mottled enamel/caries/attrition
- **Gums:** Normal/spongy/bleeding
- **Glands:** Thyroid/parotid enlargement
- **Skin:** Normal/dry and scaly/follicular hyperkeratosis/petechiae/pellagrous dermatosis/flaky paint dermatosis/ scrotal or vulval dermatosis
- **Nails:** Koilonychia
- **Edema:** Interdependent parts
- **Rachitic changes:** Knock-knee or bow leg/epiphyseal enlargement/breading of the ribs/pigeon chest
- **Internal systems:** Hepatomegaly/psychomotor change/mental confusion/sensory loss/muscle wasting/ motor weakness/loss of position sense/loss of vibration sense/loss of ankle and knee jerks/calf tenderness/ cardiac enlargement/tachycardia.

Anthropometric measurement:

Weight (kg): Head circumference (cm):

Height (cm): Chest circumference (cm):

Mid-upper arm circumference (cm): Skinfold:

Laboratory:

- **Hemoglobin:** (Specify method)
- **Stool:** Negative for OPC/Ascariasis/Ancylostomiasis/Giardiasis/Amebiasis/Strongyloides/others (specify)
- **Blood smear:** Negative/MT/BT/Filaria

Signature of Investigator

CM5.3: Define and describe common nutrition-related health disorders (including macronutrients—PEM, Micronutrients—iron, zinc, iodine, and water-soluble vitamin) and their control and management.

Q1. What (Define) is malnutrition? Mention direct and indirect effect of malnutrition. Enumerate important indicators of malnutrition. *(BNMUB, 2005; VKSUAB, 2020)*

Ans: **Malnutrition** has been defined as **"a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients."** Relative or absolute deficiency of energy providing food causes protein energy malnutrition. This may be acute (severe acute malnutrition) or chronic (stunting) in nature. Iodine and iron deficiency causes mental retardation, nutritional anemia respectively. Excess intake of vitamins may cause hypervitaminosis with variable symptoms like nausea, headache, malaise, loss of appetite etc.

The effects of malnutrition in the community are both direct and indirect.

Direct effect: Occurrence of frank and subclinical nutrition deficiency diseases is observed, such as Kwashiorkor, Marasmus, Vitamin and Mineral deficiency disorders (Xerophthalmia, Anemia).

Indirect effect: High morbidity and mortality are seen among school children. Retarded physical and mental growth and development which lead lower productivity and reduced life expectancy is evident. Malnutrition predisposes infectious diseases like TB and gastroenteritis. Malnutrition also associated with maternal morbidity, still birth and low birth weight.

Following indicators are used for surveillance of nutritional status:

Phenomenon	*Indicators*
Clinical	• Number of malnutrition cases admitted in the hospitals and health centers • Number of individuals with various deficiency disorders • Proportion of pregnant women during the last trimester with Hb level below 10 g/100 mL of blood
Anthropometric	• Percentage of newborns weighing less than 2500 g [Incidence of low birth weight (LBW)] • Weight and height standards of children up to 5 years [Quetelet index/BMI]
Statistical	• Infant mortality rate • Age specific mortality rate for the age group of 1 to 4 years • Proportional mortality rate for the age group of 1 to 4 years
Dietary	• Per capita intake of various food groups • Per capita intake of various nutrients

Q4a. Epidemiology of malnutrition in under-fives. *(RUJH, 2019)*

Ans: Undernutrition is identified as a major health and nutrition problem in India. It is not only an important cause of childhood mortality and morbidity but leads also to permanent physical impairment and mental impairment those who survive.

The frequently encounter particularly among the rural poor and urban slums in India suffering from PEM and micronutrient deficiencies. The term undernutrition encompasses stunting (chronic malnutrition), wasting (acute malnutrition) and underweight.

Persistent undernutrition through the growing phase of childhood leads to short stature in adults. About 33% of adult men and 36% women have body mass index (BMI) below 18.5 which indicates chronic energy deficiency. In case of tribal adults, 40% of men and 49% of women are below 18.5 BMI.

Children are more vulnerable to the effect of undernutrition. According to rapid survey on children 2014 about 18.5% are underweight (weight for age <5 years of age), 38.7% are stunted (height for age <5 years), 15.1% are wasted (weight for height) and <1% children under 5 years are having kwashiorkor/marasmus.

Q5. Discuss in detail causes, classification of protein energy malnutrition (PEM). Discuss its prevention strategies in terms of different levels of prevention with plan of action.

(WBUHS, 2011, 2018, 2020, 2022; AKUB, 2022; VKSUAB, 2019; AFUH, 2022, 2023; BNMUB, 2017, 2018, 2020, 2022; TRIU, 2011, 2021; SMU, 2011; SSUHSA, 2017; RUJH, 2018; YSRUHSAP, 2020; RGUHS, 2013; BUMP, 2012; NU, 2017; MGUB, 2021)

Ans: **Protein energy malnutrition (PEM):** It is identified as major health and nutritional problems in India. It occurs particularly in walking and children in the first year of life. It is not only an important cause of childhood morbidity and mortality but leads also to permanent impairment of physical and possibly of mental growth of those who survive.

Causes of PEM: *(SSUHSA, 2010)*

- **Inappropriate feeding practices:** Prelacteal feeding, delayed initiation of breastfeeding, early introduction of complementary feeding, lack of minimum meal frequency and minimum dietary diversity.
- **Infection:** Diarrhea, ARI, measle, TB, hookworm
- **Physical surroundings:** Poor sunshine, poor housing, inadequate lighting, inadequate ventilation, etc.
- **Social factors:** *(KIMS, 2014)*
  - Poverty, illiteracy, ignorance
  - Low birth weight
  - Increased birth order
  - Lack of family planning practice
  - Repeated childbirth at quicker interval
- **Cultural factors:**
  - Faulty feeding practice—discard of colostrums, prelacteal feeding, delayed initiation of breastfeeding, early introduction of complementary feeding, etc.
  - Lack of utilization of services provided by ICDS program.

Classification of PEM:

a. **Gomez classification**: *(RGUHS, 2003, 2013; TDMGRMU, 2012)*
Gomez classification is based on weight retardation according to the weight for age criteria.

$$\text{Weight for age (\%)} = \frac{\text{Weight of the child}}{\text{Weight of a normal child of same age}} \times 100$$

Interpretation:
Between 90–110%: Normal nutritional status *Between 75–89%:* 1st degree, mild malnutrition *Between 60–74%:* 2nd degree, moderate malnutrition *Under 60%:* 3rd degree, severe malnutrition

a. **Welcome's classification:**
Weight for age 60–80% with edema: Kwashiorkor
Weight for age 60–80% without edema: Undernutrition *Weight for age <60% with edema:* Marasmic kwashiorkor *Weight for age <60% without edema:* Marasmus

b. **Indian Academy of Pediatric (IAP) classification:** *Between 100–80%:* Normal nutritional status *Between 79–70%:* Grade I, mild malnutrition *Between 69–60%:* Grade II, moderate malnutrition *Between 59–50%:* Grade III, severe malnutrition *Less than 50%:* Grade IV, very severe malnutrition

Malnutrition comprises four forms: *(TRIU, 2022)*

1. **Undernutrition:** This is the condition which results when insufficient food is eaten over an extended period of time.
2. **Overnutrition:** This is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time.
3. **Imbalance:** It is the pathological state resulting from a disproportion of essential nutrients with/without the absolute deficiency of any nutrient.
4. **Specific deficiency:** It is the pathological state resulting from a relative or absolute lack of an individual nutrient. Among them, undernutrition/protein energy malnutrition is the most prevalent in our country.

Different strategies in terms of different levels of prevention

Primary prevention: Health promotion (Primary prevention plays an important role in prevention of PEM *(VNSGUS, 2023)*

- **Measures related to pregnant women to reduce low birth weight babies:**
  - There should be provision of one extra meal
  - Regular consumption of supplementary food provided by AWC

- IFA supplementation
- Diet should consist of all macro- and micronutrients

- **Promotion of appropriate breastfeeding practice according to guideline of IYCF:**
  - No prelacteal feeding
  - Early initiation of breastfeeding
  - Exclusive breastfeeding for first 6 months
- **Promotion of low-cost complementary feeding**
- **Nutrition and health education:**
  - It should be provided at Anganwadi center as Village Health and Nutrition Day or mother's meeting. It should be targeted to pregnant, lactating women, 15–49 years women
  - Improvement of family environment
  - Promotion of appropriate family planning method to prevent repeated pregnancies
  - Kitchen garden

Specific protection:

- **Child's diet should contain protein and energy rich food** maintaining minimum meal frequency and minimum dietary diversity.
- **Minimum meal frequency: 6–11 months of children:** If the child is breastfed, 1 katori of food (150 mL) 2 times in a day and if the child is not breastfed, 1 katori of food 5 times in a day. 12–23 months children and half katori of food 5 times in a day, irrespective of breastfeeding status.
- **Minimum dietary diversity:**
  - Diet should contain four types of the foods among the following seven types of food groups in 6–23 months children
  - Legumes and nut
  - Rice, grain, tuber
  - Vitamin A rich fruits and vegetables
  - Other fruits and vegetables
  - Dairy products
  - Egg
  - Flesh foods
- **Immunization of** vaccines preventable diseases
- **Food fortification** with vitamin-A, iron, iodized salt, etc.

Secondary prevention:

- Early diagnosis of PEM by regular growth monitoring and plotting in WHO growth chart
- According to the findings in growth chart, children are classified as normal, moderately and severely underweight
- **Investigations related to etiology:** Blood for hemoglobin, urine for albumin, stool for ova, parasite, CS and chest X-ray. Appropriate treatment according to etiology.
- Periodic de-worming with Albendazole

Tertiary prevention:

Children with severe PEM cases are admitted with following indications in nutritional rehabilitation center (*SSUHSA, 2023; SAMU, 2015; DU, 2015, MU, 2023*)

- Severe acute malnutrition
- Bilateral pitting edema/weight for height <−3 standard deviation/mid-arm circumference less than 11.5 cm and presence of nutritional edema/anorexia/diarrhea/vomiting/convulsion/chest infection, etc.

The treatment is divided into stabilization phase, transition phase and recovery phase.

- **Stabilization phase:** This phase is to restore the correct electrolyte and biochemical imbalance. The diet given in this phase is called the starter diet. F-75 (75 kcal/100 mL) diet is used during initial phase of treatment. These diets can be prepared locally using cow milk, sugar, vegetable oil, and water.

- **Transition phase:** Indications of transition of stabilization phase to transition phase:
  - Edema reduced
  - Gaining of appetite
  - No nasogastric tube for feeding
  - Free from any severe medical complications

  In this phase, the diet given is called catch up **diet**. F100 (100 kcal/100 mL) is used during rehabilitation phase after appetite has returned. These **diets** like F-75 can be prepared locally using cow milk, sugar, vegetable oil, and water.
- **Recovery phase:** In this phase, child, can consume the diet of 90% of the amount of total food given. Mother is also counseled about the preparation of food at home.
- Criteria for discharge:
  - Complete losing of edema
  - Regain of appetite
  - Weight gain is approximately 15%
  - Gaining of wait 5 g/kg/day on 3 consecutive days
  - Free from any medical complications

Q6a. Large numbers of malnutrition/PEM cases among under-five have been identified in your block. What social factors are responsible for it? Name the nutritional program currently available in India. Describe briefly any one of them and control measure.

(WBUHS, 2008, 2016; SMU, 2011; TRIU, 2020; NU, 2014)

Ans: Social factors responsible for PEM described in the previous questions.
Integrated childhood development services (ICDS) scheme discussed in Long Essay Q.16.

Q6b. How primary prevention plays an important role in prevention of protein energy malnutrition?

(WBUHS, 2017)

Ans: You are referred to Q.5.

Q7. Intensified National Iron Plus Initiative (I-NIPI)/Anemia Mukt Bharat strategy.

(WBUHS, 2019; SAMU, 2022; DU, 2014; RUJH, 2010; YSRUHSAP, 2023; AKUB, 2023)

Ans: To reduce anemia in girls and women by 50% new age groups are added in 12th 5-year plan in the existing Nutritional Anemia prophylaxis program.

Table 5.2: Cut off points for diagnosis of Anemia by WHO expert group.

Age groups	*No anemia*	*Mild*	*Moderate*	*Severe*
Children 6–59 months	≥11	10–10.9	7–9.9	<7
Children 5–11 years	≥11.5	11–11.4	8–10.9	<8
Children 12–14 years	≥12	11–11.9	8–10.9	<8
Nonpregnant (15 years and above)	≥12	11–11.9	8–10.9	<8
Pregnant women	≥11	10–10.9	7–9.9	<7
Adult males (15 years and above)	≥13	11–12.9	8–10.9	<8

Under the Anemia Mukt Bharat strategy has been designed to reduce the prevalence of anemia by 3 percentage points per year among children, adolescents and women in the reproductive age groups (15–49 years), **(Table 5.2)** between the year 2018 and 2022.

A snapshot of Anemia Mukt Bharat 6 × 6 × 6 Strategy is given below (Fig. 5.1):

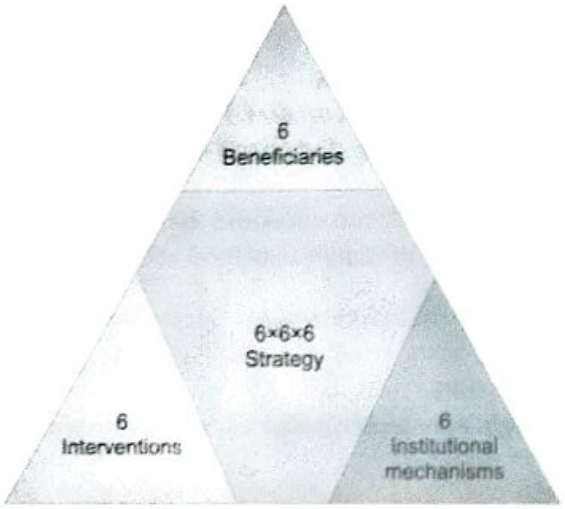


Fig. 5.1: 6 × 6 × 6 strategy.

Approximately 450 million beneficiaries—nearly 50% of the country's population will be reached through the program.

Six types of beneficiaries in Anemia Mukt Bharat Strategy

Sl. No.	*Age groups*	*Estimated beneficiaries (in million)*
1.	Children (6–59 months)	124
2.	Children (5–9 years)	134
3.	Adolescent boys (10–19 years)	47
	Adolescent girls (10–19 years)	68
4.	Women of reproductive age (20–49 years)	17
5.	Pregnant women	30
6.	Lactating women	27
	Total beneficiaries	Approximate 450 million

Six types of intervention

Sl. No.	*Name of Interventions*
1.	Prophylactic iron folic acid supplementation
2.	Deworming
3.	Intensified year-round behavior change communication campaign including ensuring delayed cord clamping
4.	Testing of anemia using digital methods and point of care treatment
5.	Mandatory provision of iron folic acid fortified foods in public health program
6.	Addressing non-nutritional causes of anemia in endemic pockets, with special focus on malaria, hemoglobinopathies and fluorosis

Six types of institutional mechanism

Sl. No.	Mechanisms
1.	Intra-ministerial coordination
2.	National Anemia Mukt Bharat unit
3.	National center of excellence and advanced research on anemia control
4.	Convergence with other ministries
5.	Strengthening supply chain and logistics
6.	Anemia Mukt Bharat dashboard and digital portal one-stop shop for anemia

Table 5.3: Iron supplementation and deworming in different age groups as per Intensified National Iron Plus Initiative (I-NIPI).

Age group	Intervention/Dose	Regime	Service delivery
6–59 months	1 mL of IFA syrup containing 20 mg of elemental iron and 100 µg of folic acid	Biweekly throughout the period 6–59 months of age and biannual de- worming with 400 mg albendazole tablet (½ tablet to children of 12–24 months and 1 tablet to the children of 25–59 months)	Through ASHA To be included in mother and child protection (MCP) card
5–9 years	Tablet of 45 mg elemental iron and 400 µg of folic acid, sugar-coated, pink color	Weekly throughout the period 5–9 years of age and bi-annual de-worming with 1 tablet of albendazole	In school through teachers and out of school children through Anganwadi center (AWC) mobilized by ASHA
10–19 years, school-going and out of school adolescent boys and girls	60 mg elemental iron and 500 µg of folic acid tablet, sugar-coated, blue color	Weekly throughout the period 10–19 years of age and bi-annual de-worming with 1 tablet of albendazole	In school through teachers and out of school children through AWC mobilized by ASHA
Women in reproductive age group (nonpregnant and nonlactating) 20–49 years	60 mg elemental iron and 500 µg of folic acid tablet	Weekly throughout the reproductive period and bi-annual deworming with 1 tablet of albendazole	Through ASHA during home visit for contraceptive distribution
Pregnant and lactating mothers (0–6 months of child)	60 mg elemental iron and 500 µg of folic acid tablet	1 tablet daily for starting 4th months of pregnancy, continued throughout pregnancy (minimum of 180 days and to be continued for 180 days of postpartum period and deworming with 1 tablet of albendazole preferably during 2nd trimester	ANC/ANM/ASHA To be included in mother and child protection card (MCPC)

Note: All women of reproductive age group in the preconception period up to 1st trimester, advised to have 400 µg of folic acid tablets, daily to **reduce the incidence of neural tube defects in the fetus.**

Supplementation of IFA for 6–59 months children as per I-NIPI guidelines (Table 5.3): Children of 6–59 months of age groups biweekly IFA syrup should be distributed by ASHA through home visits and mothers will be equipped with skills to provide in households level. Iron folic acid supplements supplied in a 100 mL bottle. One mL of IFA syrup biweekly for 100 doses in a year. ASHA will provide IFA syrup (1 mL) biweekly for the 1st week during the home visit under supervision. The micro plan for reaching out to these children can be worked out at village level. Additionally, ASHA will demonstrate skills to mothers/caregivers to provide IFA syrup through auto-dispenser bottle and counsel mothers on the benefits of IFA syrup for their child and will discuss also about iron and folate containing diets, importance of sanitation and hygiene practices to prevent anemia and worm infestation in the child.

Q7a. Mention the causes and detrimental effects of nutritional anemia. Describe the measures undertaken to combat anemia among adolescents (pregnant ladies and young children) according to national program. *(WBUHS, 2018; ABKUB, 2017, 2023; RGUHS, 2024; MGUB, 2023)*

Q7b. How do you manage and prevent nutritional anemia among pregnant woman? *(MGUB, 2022; TRIU, 2013; RUJH, 2012; SSUHSA, 2011, 2017; BUMP, 2016; GOAU, 2023)*

Ans: Nutritional anemia is an important public health problem in our country. Studies show that 50–60% women of lower socioeconomic groups are anemic in the last trimester of pregnancy, which is associated with high incidence of premature birth, PPH, puerperal sepsis, thromboembolic phenomenon of the mother and low birth weight of the baby, etc.

Important causes of anemia:

- Decreased intake of iron and folic acid rich diet
- Increased demand during pregnancy not fulfilled
- Associated disease like hook worm infestation, malaria, peptic ulcer, etc.

Social cause: Poverty, illiteracy, ignorance, lack of awareness, etc.

The detrimental effects of nutritional anemia are seen in the important condition:

- **Pregnancy:** Anemia increases the risk of maternal and fetal morbidity and mortality. About 20% of maternal death due to anemia, conditions are abortions, premature births, low birth weight and postpartum hemorrhage.
- **Infection:** Anemia can be caused or aggravated by parasitic disease, e.g., malaria, intestinal parasite such as hookworm.
- **Work capacity:** Mild anemia may cause a significant impairment of maximal work capacity. More severe the anemia, greater reduction of work capacity and productivity resulting significant loss of GDP.

National Iron Plus Initiative was launched to overcome the problem of anemia in different age groups specially adolescents, young children and pregnant mother.

To combat this problem, Government of India sponsored National Nutritional Anemia Prophylaxis Program which is now merged with RMNCH +A.

Q7c. Strategies for prevention and control in pregnant women *(MGUB, 2022; BNMUB, 2011; RGUHS, 2008; GOAU, 2023)*

Q7d. A woman, 3rd gavid in 2nd trimester of pregnancy, attended with hemoglobin 7.5 g% and weight 45 kg. What advice you will give? *(TRIU, 2021; GNSUB, 2023)*

Anemia prophylaxis and treatment: This has been revised 2018. All pregnant women are supplemented with IFA tablets containing 60 mg of elemental iron and 500 µg of folic acid in each tablet starting from 4th months of pregnancy for minimum of 180 days and continued for 180 days in postpartum period daily preferably after morning meal or 2 hours after lunch.

Therapeutic dose of IFA and follow-up:

Anemia management protocol for pregnant women:

Hb level	10–10.9 g/dL (Mild anemia)	7–9.9 g/dL (Moderate anemia)	5.0–6.9 g/dL (Severe anemia)
1st level	2 IFA tab as per advice. Parental iron (I/V iron sucrose) detected anemia at late pregnancy or in whom compliance is likely to be low (lost to follow-up)	2 IFA tab as per advice. Parental iron (I/V iron sucrose) detected anemia at late pregnancy or in whom compliance is likely to be low (lost to follow-up)	Management of severe anemia in pregnant women will be done by Medical officer at PHC/CHC/ FRU/DH. The treatment will be done using I/V iron sucrose by medical officer Immediate hospitalization in FRU (24 × 7 care)

Contd...

Contd...

Hb level	10–10.9 g/dL (Mild anemia)	7–9.9 g/dL (Moderate anemia)	5.0–6.9 g/dL (Severe anemia)
Follow-up	Every 2 months for compliance of treatment by health provider during the contact If Hb level comes to normal level, discontinue the treatment and continue prophylactic dose of IFA	Every 2 months for compliance of treatment by health provider at regular ANC clinics/PMSMA/VHND The contact is to be utilized by health provider to also conduct Hb estimation of anemic cases every month. If Hb level comes to normal level, discontinue the treatment and continue prophylactic dose of IFA	After 1st level of treatment monthly or as prescribed by medical officer
If no improvement after 1st level of treatment	If no improvement in Hb (<1 g/dL increase) after 1 month of treatment, refer to FRU/DH by health provider The case to be referred to FRU/DH for further investigations for cause of anemia and may manage with (I/V sucrose)	If no improvement in Hb (<1 g/dL increase) after 2 months of treatment, refer to FRU/DH by health provider The case to be referred to FRU/DH for further investigations for cause of anemia and may manage with (I/V sucrose)	As prescribed by medical officer

Many women did not consume the full course due to several reasons. To combat this situation, following advices should be given by the AWW or ANM helps the beneficiaries providing the following information during distribution:

- Constipation or diarrhea, **black stool may occur in first few days**, but it will be gradually tolerated.
- It should not be consumed in empty stomach or after heavy meal. It should be consumed after snacks.
- Tea should not be consumed just after consumption of IFA tablet, because it hampers absorption.
- Vitamin C rich diet like lemon, orange facilitates its absorption.
- Pregnant woman with severe anemia should be admitted to FRU for blood transfusion.
- **Dietary modification:** Promotion of iron and folic acid rich diet:
  - *Iron rich diet:* It has both animal and plant sources. Important animal sources are meat specially liver, poultry fish, etc. They are rich in haem iron. They also promote the absorption of nonhaem iron. Foods containing nonhaem iron are vegetable origin like cereals, green leafy vegetables, legumes, nut, oilseeds, jaggery, etc. The bioavailability of nonhaem iron are poor due to presence of phytate, oxalate, carbonate, phosphate, etc.
  - *Folic acid rich diet:* Dairy products, egg, milk, fruits, cereals, etc.
- **Iron fortification:** Addition of ferric orthophosphate or ferrous sulfate was enough to fortify salt with iron.
- Treatment of associated conditions like hook worm infestation, malaria, etc.
- **Health education:** It can be given through interpersonal, group and mass approach. Medical officer, BPHN, PHN, ANM, AWW, ASHA can be utilized as health educator.

Q7e. Anemia is a very common problem amongst the pregnant ladies. Discuss the etiopathogenesis, prevention and control of this problem. *(WBUHS, 2024; BNMUB, 2006)*

Ans: Etiopathogenesis of anemia:

- Decrease storage of iron without any other detectable abnormalities
- **An intermediate stage of latent iron deficiency:** Iron stores are exhausted but anemia did not occur. It depends upon measurement of serum ferritin levels. Normal value is 10 µg/L.
- **Serum transferrin saturation:** Normal value 15–30%.
- **Overt iron deficiency:** Decrease concentration of circulating hemoglobin.

Prevention and control of anemia discussed in the Q.7.

Q7f. With the help of a planning cycle, write up a plan to reduce "Anemia during Pregnancy" in your locality *(MU, 2023)*/**Prepare an action plan to conduct IEC campaign in your block to reduce anemia among pregnant woman.** *(WBUHS, 2019)*

Q7g. Prevalence of anemia among pregnant women is high compared to state and national average in this block of your posting. On enquiry, the ANMs reported the pregnant women are unwilling to consume IFA tablets given to them during antenatal check- ups. As BMOH of the block, design and implementation plan to address the issue. *(WBUHS, 2024)*

Ans: Unwilling to consume IFA tab, i.e., the main problem as stated by ANM of the block.

Nutritional anemia is an important public health problem among pregnant women. It can lead to health problems among both mother (like death due to hemorrhage) and her child (low birth weight, etc.). Health education is a useful step for prevention of nutritional anemia which can reduce both maternal and child morbidity. Information, education and communication (IEC) may play its role in highest possible level to reduce anemia like vaccination against communicable diseases.

Steps of planning to conduct IEC campaign in a block to reduce anemia among pregnant women can be as follows:

a. **Collecting baseline data and information (Situation analysis)**

This step is very important for an effective health education program. They indicate the initial status of the situation and are essential for planning. The level of health-related knowledge, attitude and behavior must be accessed through educational diagnosis. The information will normally be collected in the following areas.

i. Demographic pattern of population (total population, total number of pregnant women, distribution of women according to age, etc.)
ii. Socio-economic and cultural life (religion, habits, customs, belief, family pattern, occupation, etc.).
iii. Available health services in the community (hospitals, health center, sub-center, AWC, etc.)
iv. Literacy rate, language, channels of communication
v. Local leaders and opinion makers may be interviewed to consider their opinion.
vi. IFA availability and utilization, albendazole availability and utilization, food consumption behavior, etc., are very much important issues to consider the priority.

b. **Identifying health and health education needs on priority basis**

There are certain criteria to be considered for prioritization:

i. Can meet the need in terms of available resources
ii. Felt needs of the people concerned with anemia prevalence
iii. Widespread problem and severity

From baseline data and information, content of IEC can be chosen from many important issues. one or two very important issues will be selected for IEC campaign to reduce anemia among pregnant women.

c. **Establishing goals and objectives:**

A goal is expressed in general or broad term which denotes overall fulfilment of program. Objectives lead to the precise direction and are developed to fulfil the goal of the program.

Goal can be conceived as to provide the health education to the pregnant women on prevention of nutritional anemia and to motivate at least 80% of the mothers for regular consumption of iron rich diet and IFA tablets starting of 4th months of pregnancy continue for 180 days and again 180 days after delivery.

Objectives are framed so that within 6 months of the health education program

i. 90% of the pregnant women can tell the hazards of nutritional anemia in pregnancy.
ii. 90% of the pregnant women will appreciate the importance of prevention of nutritional anemia by regular consumption of iron rich diet and IFA tablet.
iii. 90% of the pregnant women will enumerate common animal and plant sources of iron rich food.
iv. 90% of the pregnant women can tell about rules of consumption of IFA tablets to increase the compliance.
v. 80% of the pregnant women consume 100 IFA tablets.
vi. Most of the pregnant mothers are able to consume Albendazole (400 mg) in 2nd trimester.

d. Identifying necessary and available resources:
Following kinds of resources are utilized in health education program:
a. Manpower—health educator, volunteers, other support staffs, statistician, etc.
b. Material—building, communication material, computer, projector, vehicles, etc.
c. Money—Money is required for purchasing of communication material, rent of the building, payment of the health educator, payment for the vehicle, etc.

e. **Deciding target group:**
To make the health education activities economical, feasible, fruitful, core group is selected as target group. In deciding the target group, following criteria should be kept in mind:
i. Most likely to be receptive to the introduction of new ideas affecting their health behavior.
ii. Most likely to change their behavior and also influence for change of other's behavior.
Pregnant women, women having one child, mother-in-laws, unmarried marriageable women, village leaders, health workers (for reorientation), etc., are examples of stakeholders for anemia control.

f. **Deciding contents to be taught:**
It is based on objectives set like:
a. Hazards of nutritional anemia in pregnancy.
b. Methods of prevention of nutritional anemia.
c. Common source of iron rich diet.
d. Role of IFA tablets and Albendazole for prevention of nutritional anemia.
e. Rules of consumption of IFA tablets to improve the compliance.
f. Importance of using chappals/shoes to prevent anemia due to hook worm infestation.

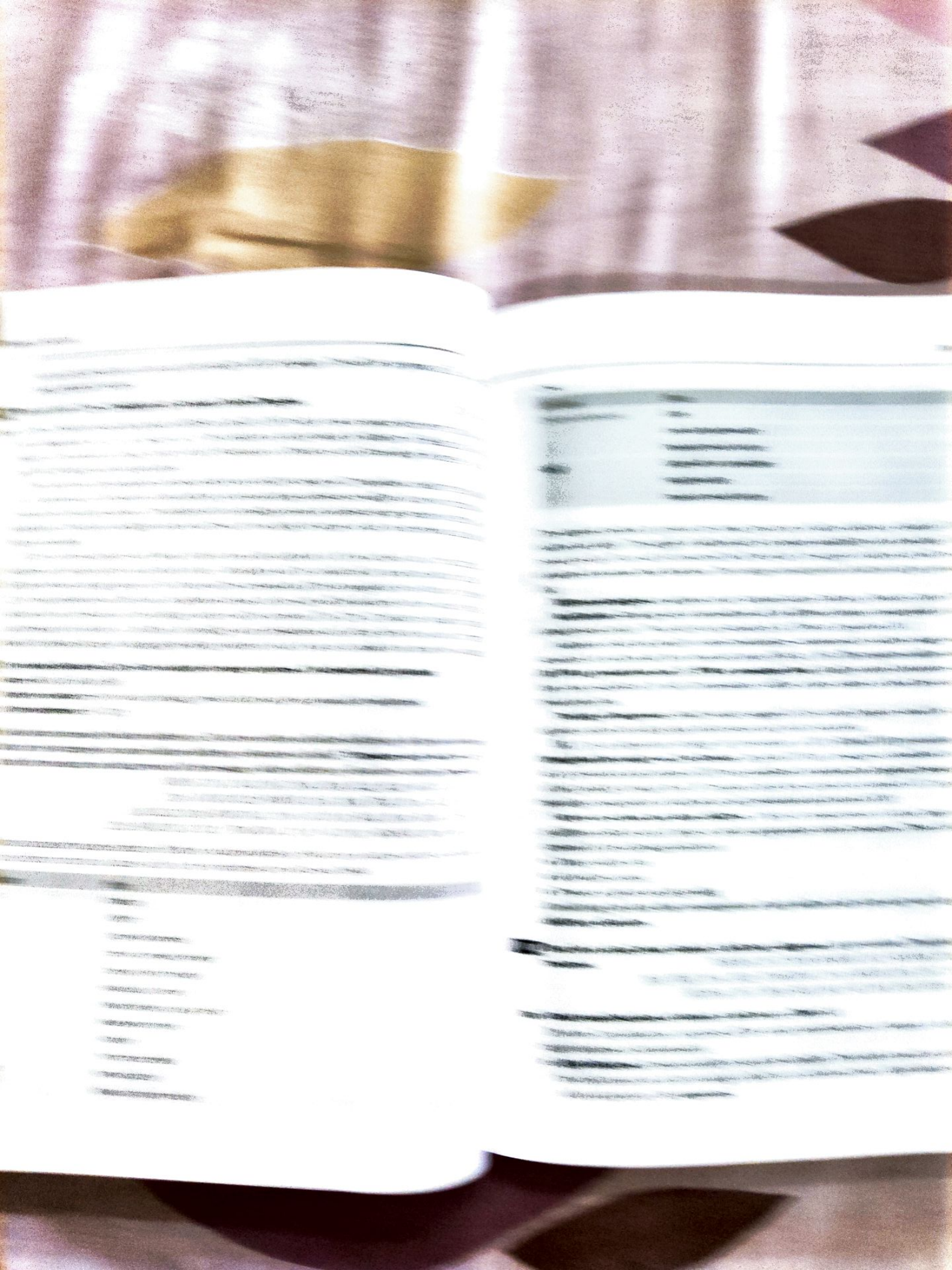
g. **Deciding for appropriate methods and media:**
The methods and media for giving health education should depend upon the nature of objectives, contents and target people.
Methods: (i) Interview, (ii) Discussion, (iii) Counseling, (iv) Mini lecture, (v) Role playing, etc., (vi) Group discussion (mixed or focus), etc.
Medias: (i) Flip chart, (ii) Posters, (iii) Pamphlets, (iv) Models, (v) Flannelgraph, etc.
All these above methods and media can be utilized for IEC among stakeholders.

h. **Training:**
a. Capacity building of ASHA and AWW
b. Supply chain management
c. Health communication through group discussion, IPC, mass media
d. Supportive supervision
e. Follow up

i. **Developing a detail plan of action:**
It specifies the following aspects:
a. Specific objectives.
b. Contents to be taught.
c. Target groups to deal with.
d. Methods and media to be used.
e. Kind of manpower to be involved
f. Date and time of teaching with duration mentioned.
g. Location where health education is given, such as health posts, school, AWC, etc.
h. Program monitoring by superior staff

j. **Determining the time and techniques for evaluation:**
Provision for evaluating the health education program is one of the steps of planning. Formative evaluation will be done at two monthly interval and summative evaluation will be done after 6 months. Evaluation will be done by different techniques like interview, observation, record review, etc.

k. **Conclusion:** This is a brief account of action plan for IEC campaign to reduce anemia among pregnant women. This should be associated with check-up of practice done by pregnant women of the same area or



to assess the prevalence of anemia in the locality of IEC campaign. This will be the proof of IEC campaign among pregnant women.

Q7h. Write in brief 12 by 12 initiative for Anemia Control Program. *(RUHS 201*

Ans: A 12 by 12 initiative was launched at AIIMS on April 24, 2007 with a view to ensure that every child should have hemoglobin of 12 g by the age of 12. This initiative is jointly taken by Ministry of Health and Family Welfare, Government of India; WHO; FOGSI (Federation of Obstetrics and Gynecology Societies of India) and UNICEF along with other partners.

The objectives of the program is to ensure that every child by the age of 12 years has a healthy hemoglobin level. Awareness and correction of iron deficiency anemia during adolescence will go a long way in improving the health of the future parents. The initiative for controlling anemia in adolescent age groups is effective and sustainable. This nation building exercise will result in reaching the target of safe motherhood and healthy future generations.

All the partners agencies will work in their areas like adoption of a few schools and creating public awareness by giving advice on diet rich in iron. Workshops will be conducted in rural and slum areas. The children between the age group of 10–14 year will be screened and if the hemoglobin level found to be below 12 g, iron supplements will be given. In adopted schools, an iron-day will be declared where students will be educated about the issue and their dietary pattern will be corrected. The 12 by 12 initiative program focuses on increasing iron intake of children, controlling worm infestations and other infections and improving overall nutritional status by changing the dietary pattern in such a way as to make iron more bio-available.

Q8. Zinc-related disorders: Zinc is the cofactor for many enzymes. It is absorbed in jejunum.
Sources: Meat, milk and fish.
Deficiency disorder: Poor wound healing, growth failure and poor gonadal development.
Daily requirement: 10–12 mg

Q9. Enlist disorder caused by iodine deficiency, Ill/adverse effects of iodine deficiency in the environment. What are the strategies to control iodine deficiency disorders in India? "Consume only iodized salt'– Explain the meaning and background of the message, iodine deficiency disorders control program.
(WBUHS, 2011, 2012, 2017, 2018, 2020, 2022, 2023; MGUB, 2022, 2023, 2024; GNSUB, 2022; BNMUB, 2015, 2018; TRIU, 2015, 2022; SSUHS, 2018, 2022, 2024; BUMP, 2012, 2016; DU, 2013; SMU, 2010; RUJH, 2009, 2015, 2023; SAMU, 2011, 2012; TDMGRMU, 2013; NU, 2011; NIMSUR, 2015; MU, 2022

Ans: Disorders caused by iodine deficiency/Ill effects of iodine deficiency /Spectrum of iodine deficiency disorders
Iodine deficiency affects all stages of life in the environment are discussed below:

Life stage	*Effects*
Fetus	Abortion
	Stillbirth
	Congenital anomalies
	Increased perinatal mortality
	Increased infant mortality
	Neurological cretinism
	Mental deficiency, deaf, mutism
	Myxedema cretinism
	Dwarfism
	Psychomotor defects
Neonate	Neonatal goiter
	Neonatal hypothyroidism

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Life stage	Effects
Child and adolescent	Goiter
	Juvenile hypothyroidism
	Impaired mental function
Adult	Goiter with its complication
	Hypothyroidism
	Impaired mental function

The simplest method to prevent the broad spectrum of iodine deficiency disorder (IDD) is to consume iodized salt daily. The supply of iodized salt is to ensure availability of not less than 150 µg of iodine per person per day. Since salt is consumed by all every day, the supply of iodized salt will ensure the availability of iodine for normal body function. The average consumption of iodized salt per person per day is about 10 g.

Different strategies are adopted under National Iodine Deficiency Disorder Control Program (NIDDCP):

Notification: Banning sale of noniodized salt for different human consumption in the entire country is already issued under "Food safety and standards Act 2006 and regulation 2011".

Iodization of salt and quality control mechanism—common salt is iodized using potassium Iodate. The standards for iodized salt have been laid under PFA Act, 1954. **This requires iodine content of the salt as 30 PPM at production and 15 PPM at consumer level**. Quality control laboratories under the NIDDCP have been established by Salt Commissioner's office at nine centers to check the quality of iodized salt at production level.

Training of manpower: Health worker engaged in the control program should be trained on all aspects of goiter control including legal enforcement and public education.

IEC: It is an important strategy for prevention of IDD. **Global IDD prevention day was observed throughout the country on 21st October.** On global IDD day, messages on benefits of consumption of iodized salt in prevention and control of IDD were published in national and regional newspapers. The directorate of field publicity through their 207 regional units have carried out extensive IEC campaigns in the country regarding consumption of iodized salt and prevention and control of IDD.

Survey on school and slum children: It helps in measurement of actual magnitude of the problem in different districts and it helps to decide appropriate control measures. These children are periodically screened for the following indicators:

- Urinary iodine level
- Salt iodine content
- Presence of goiter and its grading

Considering the facts that consumption of only iodized salt is the only way for prevention of iodine deficiency disorders.

Q10. Describe in detail about vitamin A deficiency diagnosis, its prevention [Prophylactic Schedule] and treatment. *(WBUHS, 2017, 2019; BNMUB, 2013; VKSUAB, 2020; RGUHS, 2013, 2014, 2015; TRIU, 2014, 2023; TDMGRMU, 2014; ABKUB, 2015, 2017, 2023; KIMS, 2013, 2019; SSUHSA, 2017, 2024; SMU, 2013; NU, 2013, 2015; RUJH, 2010, 2023; DU, 2016)*

Ans: Ocular manifestations of vitamin A deficiency: (Table 5.4)

The term Xerophthalmia comprises all the ocular manifestations of vitamin A deficiencies ranging from night blindness to keratomalacia.

- **Night blindness:** It means inability to see in the dim light. The mother herself can detect the condition when the child cannot see in late evening or find her in a darkened room. Night blindness is due to impairment of dark adaptation **(1st symptoms).**

Table 5.4: WHO classification of vitamin A deficiency.

XN	Night blindness (nyctalopia)
X1A	Conjunctival xerosis
X1B	Bitot's spots
X2	Corneal xerosis
X3A	Corneal ulceration/Keratomalacia affecting <1/3rd of corneal surface
X3B	Corneal ulceration/Keratomalacia affecting >1/3rd of corneal surface
XS	Corneal scar due to xerophthalmia
XF	Xerophthalmic fundus

- **Conjunctival xerosis: This is the 1st clinical sign of vitamin A deficiency**. The conjunctiva becomes dry and nonwettable. Instead of looking smooth and shiny, it appears muddy and wrinkled (**1st sign**).
- **Bitot's spots:** These are triangular, pearly-white or yellowish, foamy spots on the bulbar conjunctiva on either side of the cornea. *(SSUHSA, 2013)*
- **Corneal xerosis:** In this stage, cornea appears dull, dry, nonwettable and eventually opaque. It does not have a moist appearance. In most deficiency, there may be corneal ulceration.
- **Keratomalacia:** It is a grave medical emergency. The cornea (a part or the whole) may become soft or burst open. The process is a rapid one. If the eye collapses, vision is lost.

Extraocular manifestations of vitamin A deficiency:

- Follicular hyperkeratosis
- Anorexia
- Growth retardation
- Increase mortality and morbidity due to respiratory and intestinal infection

Q10a. Short-term high dose of vitamin A oil supplementation is useful for prevention of xerophthalmia. Justify. *(WBUHS, 2012; SAMU, 2022; VNSGUS, 2023)*

Ans: Xerophthalmia is an important public health problem in our country which means ocular manifestations of vitamin A deficiency ranging from night blindness to keratomalacia. Prevention and control of vitamin A deficiency can be achieved through the following strategies:

Short-term high dose vitamin A supplementation: Since vitamin A can be stored in the body for 6–9 months and liberated slowly, a short-term simple technology has been evolved by the National Institute of Nutrition at Hyderabad for community-based intervention against nutritional blindness. First dose of 1,00,000 IU is given at 9 months and 2,00,000 IU given at 16–24 months. Remaining doses are given at 6 months interval up to 5 years. In such way, short-term vitamin A oil supplementation is used for prevention of xerophthalmia. **(Details given in Table 5.5).** Improvement of family diet is required to ensure a regular and adequate intake of foods rich in vitamin A, but this is difficult to achieve for various reasons.

Improvement of family diet is judiciously required to ensure a regular and adequate intake of foods rich in vitamin A though this is difficult to achieve for various reasons. By reducing the frequency and severity of contributory factors, such as PEM, respiratory tract infection, measles and diarrhea, vitamin A deficiency can be controlled.

Treatment: Vitamin A deficiency should be treated urgently; administration of 2 lakh IU of vitamin A stat dose all children at the age of ≥12 months. Children aged 6–12 months recommended doses 1 lakh IU of vitamin A and repeat after 4 weeks.

Table 5.5: Vitamin A prophylaxis schedule (9 months—5 years children).

No. of dose	Age of the child	Dose	Remarks
1.	9 months	100000 IU	Along with measles vaccine
2.	1½ years	200000 IU	With booster doses of DPT and OPV
3.	2 years	200000 IU	Nil
4.	2½ years	200000 IU	Nil
5.	3 years	200000 IU	Nil
6.	3½ years	200000 IU	Nil
7.	4 years	200000 IU	Nil
8.	4½ years	200000 IU	Nil
9.	5 years	200000 IU	Nil
	Total	**17, 00000 IU**	

Q10b. Vitamin A supplementation is necessary after measles infection. Give reasons.

(WBUHS, 2011; ABKUB, 2023)

Ans: Measles is an exanthematous disease. It can cause invasion of intestinal and respiratory epithelium which causes huge desquamation of epithelium. This causes lowered absorption of all kinds of ingredients present in the food consumed. Vitamin A is not the exception. Again, measles itself can cause vitamin A depletion in the body.

On top of this problem, low serum retinol level/sub-clinical vitamin A deficiency is the risk factor for higher mortality and morbidity. Synergy of measles and vitamin A deficiency has additive pathological effect on epithelia and immune system. Infection will be commonly seen in such a case.

Promoting vitamin A supplementation in children with measles contributes to the control of blindness in children, which is a high priority within the World Health Organization (WHO) Vision 2020: The Right to Sight Program.

2nd dose of MR vaccine also added in the national immunization schedule to combat the problem of measles and prophylaxis of vitamin A up to 5 years.

By the above-mentioned explanation substantiate that **vitamin A supplementation is necessary after measles infection.**

Q10c. Synopsis of water-soluble vitamins:

Water-soluble vitamins	Function	Sources	Deficiency disorder	Daily requirement
Thiamine (B_1)	• Blood formation • Metabolism of carbohydrate • Enhances learning and memory	Yeast, rice bran, wheat, cabbage, ground nut, meat, liver, kidney, fish, un-milled cereals	• Beriberi • Tiredness and fatigue • Wernicke's encephalopathy	0.5 mg per 1000 kilocalories of energy
Riboflavin (B_2)	• Red cell production • Digestion and energy production • Healthy skin, hair and nail	Dairy products, egg, liver, green leafy vegetables, legume, nuts	Angular stomatitis, cheilitis, glossitis,	0.6 mg per 1000 kilocalories of energy
Niacin (B_3)	Essential for metabolism of carbohydrates, proteins and fats	Whole cereals, nuts, meat, rice bran, liver	Pellagra, diarrhea, dermatitis, dementia	6.0 mg per 1000 kilocalories of energy
Pantothenic acid (B_5)	• Biosynthesis of corticosteroids • Prevent ageing • Healthy skin and nerves	Beef, liver, milk, egg, rice, mushrooms, potatoes, cereals, legume, nuts and oil seeds	• Tremor irritability • Neuromotor disorders	10 mg per day

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Water-soluble vitamins	Function	Sources	Deficiency disorder	Daily requirement
Pyridoxin (B_6)	• Metabolism of proteins and fats • Conversion of tryptophan into nicotinic acid	Meat, liver, whole cereal, grains, vegetables	Polyneuropathy Angular stomatitis	0.6–2.5 mg per 1000 kilocalories of energy
Folic acid (B_9)	Normal development of blood cells in the marrow	Liver, meat, dairy products, egg, fruits and vegetables	• Megaloblastic anemia • Glossitis, cheilosis, infertility	200–500 µg
Cyanocobalamin (B_{12})	• Metabolism of folic acid • Maturation of cells	**Present only in animal food**, liver, meat, eggs, milk, cheese, etc.	• Megaloblastic anemia • Neuropathy • Glossitis	1 µg
Vitamin C	• Bone and teeth calcification • Absorption of iron • Collagen synthesis	Fresh citrus fruits and vegetables, germinated pulses, orange, grapes, alma, guava	• Delayed wound healing • Bleeding gums • Scurvy	40 mg

Q11a. Fluorine is often called two-edged sword. Explain/Endemic fluorosis.

(WBUHS, 2012, 2020, 2022; AKUB, 2022; MU, 2023)

Ans: Fluorine is an important micronutrient and is the most abundant element in nature. Fluorine is essential for the normal mineralization of bones and formation of dental enamel. The recommended level of fluorine in drinking water in India is accepted as 0.5 to 0.8 mg per liter. Deficiency of fluorine can cause dental caries. Use of fluorine is recognized as the most effective means for prevention of dental caries. Prolonged ingestion of fluorides through drinking water in excess of daily requirement is associated with dental and skeletal fluorosis. Dental fluorosis has been reported at levels above 1.5 mg/L of intake. Dental fluorosis is characterized by chalky white teeth, transverse yellow brown/dark brown bands on teeth. Skeletal fluorosis is associated with lifetime daily intake of 3–6 mg/L or more. There is heavy fluoride deposition in the skeleton. Dental fluorosis is characterized by chalky white teeth, transverse yellow brown/dark brown bands on teeth. Skeletal fluorosis is characterized by severe pain and stiffness in neck and backbone, severe pain and stiffness in joints, severe pain and rigidity of hip region, inability to squat, ugly gait and posture.

Both the deficiency of fluorine and the excess of fluorine cause health problem in a person. This should be in optimum concentration in water. Otherwise, fluorine will act as double-edged sword.

Q11b. Endemic fluorosis with prevention [Defluoridation of water]. *(WBUHS, 2017; RGUHS, 2011, 2024; TDMGRMU, 2011, 2013; RUJH, 2012; GOAU, 2022)*

Ans: Endemic fluorosis is reported when drinking water contains excessive amount of fluorine **(3–5 mg/L)**. Endemic fluorosis has been reported to be an important health problem in certain parts of the country, e.g. Andhra Pradesh (Nellore, Nalgonda and Prakasam districts), Punjab, Haryana, Karnataka, Kerala and Tamil Nadu.

The **toxic manifestation of fluorosis** comprises the following:

- **Dental fluorosis**
- **Skeletal fluorosis**
- **Genu valgum**

Prevention and control measure:

- **Changing the water source:** Find out new source of drinking water with fluoride content 0.5–0.8 mg/L if possible. Running surface water can be used and it contains lower quantities of fluorides like well water.

- **Chemical treatment:** If the above method is not possible then water can be defluorinated chemically through water treatment plant though costly. National Environmental Engineering Research Institute, Nagpur developed a technique for removal of fluoride called **Nalgonda Technique**. Here two chemicals (lime and alum) are used in sequence followed by flocculation, sedimentation and filtration.
- **Other measures:** In the area endemic for fluorosis, toothpaste containing fluoride not recommended for children up to 6 years of age.

Q12. Which vitamin deficiency can cause psychosis and why? *(RGUHS, 2011)*

Deficiency of thiamine (Vitamin B_1) can cause Korsakoff's psychosis. The cause of the disorder is thiamine (vitamin B_1) deficiency, which can cause a range of disorders including beriberi, Wernicke's encephalopathy, and Korsakoff's psychosis. These disorders may manifest together or separately. WKS is usually secondary to alcohol abuse. It mainly causes vision changes, ataxia and impaired memory.

Sergei Korsakoff was a Russian physician after whom the disease "Korsakoff's Syndrome" is named. In the late 1800s, Korsakoff was studying long-term alcoholic patients and began to notice a decline in their memory function.

Reasons: Active form of thiamine is thiamine di-phosphate which plays a major role as cofactor or coenzymes associated with CAC cycle and catalyze oxidation of pyruvate, alpha-ketoglutarate and branched chain amino acids.

This leads to accumulation of pyruvic acid and lactic acid in parts of brain leading to atrophy of specific regions of brain, especially mammillary bodies, anterior region of thalamus, medial dorsal thalamus, basal forebrain and median and dorsal raphe nuclei. This atrophy will cause psychosis in a person.

CMS.5: Describe the principles of nutritional rehabilitation in the context of sociocultural factors.

Management of SAM—answer in Q.5

- **Nutrition of adolescents, pregnant women and lactating mother:** Malnutrition have intergeneration effects. Adequate nutrition to young girls is of paramount concern to prepare them for safe motherhood. Nutrition education and supplementation of iron and folic acid to adolescents is essential to prevent and treat anemia and to ensure good reproductive health. Right age of marriage and adequate nutrition of pregnant mother will prevent low birth weight babies and also lower maternal morbidity and mortality.
- **Food production and distribution:** India have achieve self-sufficiency in food production and also having buffer food stocks. Food grain production of over 273 million tonnes during the year 2016, ensures reasonable food security at national level and the program of poverty alleviation and targeted public distribution system further ensure food security at household level through increased purchasing power and access to highly subsidized food grains.
- **Public distribution system:** Under the public distribution system (PDS), below poverty line families are covered. PDS in India is perhaps the largest distribution network in the world.
- **Annapurna Yojana:** Under this scheme, the old destitute individuals who are not receiving old age pension are entitled to 10 kg of grain per month free of cost.
- **Mahatma Gandhi National Rural Employment Guarantee Act and Scheme:** To increase food security and purchasing power as per the act, any adult in rural area can apply for work is entitled to being employed on public works within 15 days. The work guarantee is limited to 100 days per household per year.
- **Training of manpower:** Manpower are being trained all over the countries on nutrition by the universities, home science colleges, medical colleges, regional and district training centers.
- **Population stabilization:** India formulates National Family Welfare Programme in 1952. The objective of the policy is to reduce birth rate thereby stabilize the population. Unless we control the population growth, the problem of malnutrition will continue.
- **National Nutrition Policy:** It was adopted in 1993 and advocated comprehensive intersectoral strategy for alleviating the multifaceted problem of malnutrition.

CM5.5: Describe the principles of nutritional education in the context of sociocultural factors.

Effective communication strategy: Too much of technical knowledge and all book recipes are handed over to mothers for improving dietary practices which are in conflict with cultural and economic conditions of the family. Local workers can communicate best nutrition messages in their local vernacular. Local worker's data and information must be put on use to increase the ownership and measure the success of best practices adopted at local household level and success must be attributed to mothers/parents.

Key principles:

- Mothers hold the key for improvement of nutritional status of young children, must be supported by health and ICDS system.
- Nutrition education message should not be in conflict with local beliefs and cultural practices.
- AWWs and ASHAs can deliver best nutrition education messages.
- Encourage home available cereals and pulses and cooked food.

Target groups for nutrition education (NE): Adolescent girls, pregnant and lactating women

Responsible persons and frequency of NE: Responsible persons are AWWs, ASHAs, ANMs. Once in every month during growth monitoring session and mothers meeting and in village Health Sanitation and Nutrition Day besides regular home visits.

Involvement of mass media and other channel: Group meeting with mothers, interpersonal communication with mother during home visits and demonstration of weighing and monitoring growth on weight charts and actual demonstration of feeding children at Anganwadi by mothers besides TV and Radio-audio messages.

Follow-up initiatives: To sustain behavior change regular contacts with mothers by home visits and on follow-up days of growth monitoring are essential.

Evaluation: Workers themselves evaluate the results of sustained nutrition education activities/sessions by:

- Growth monitoring on growth charts Mother and Child Protection Card (MCPC) and observing feeding practices during home visits
- During annual household surveys to measure outcome/impact of NE.

CM5.5: Describe the methods of nutritional surveillance.

Definition of nutritional surveillance: "Keeping watch over nutrition, in order to make decisions that will lead to improvement in nutrition in population".

The objectives of nutritional surveillance are to:

- Aid long-term planning in health and development
- Provide input for program management and evaluation
- Give timely warning and intervention to prevent short-term food consumption crisis

Indicators used for nutritional surveillance discussed in Q.4

Q13. Describe nutritional surveillance. *(BNMUB, 2021; PBDSUHSH, 2017, 2018)*

Ans: Nutritional surveillance can be carried out on the representative sample of children in a community. Manpower, materials (logistics) and money (fund) are required to conduct such activities. It an important tool for identifying existing system for collecting information on the current and future magnitude, distribution and causes of malnutrition in population with the emphasis on protein energy malnutrition to assist governments and international agencies in policy formulation. It was presumed initially that there are some diseases which occur due to nutritional deficiencies like anemia, rickets but later it was revealed that it includes wide range of morbidities like obesity, hypertension, cancers, dental caries, etc. It gives a reliable idea of the overall nutritional condition of a village. It can help to diagnose malnutrition and assess the impact of occurrence like drought or measures designed to alleviate malnutrition in the community at large. Whether one village

is good or bad, is better or worse than other villages. After conducting this procedure, it will reveal whether the nutritional status is improving or deteriorating with time.

Q14. Difference between growth monitoring and nutritional surveillance.
(WBUHS, 2021; AKUB, 2022; PBDSUHSH, 2015)

Points of difference	Growth monitoring	Nutritional surveillance
Strategy	Preservation of normal growth	Detection of undernutrition
Approach	Educational motivational	Diagnostic interventional
Enrolment, age groups and sample size	All infants, starting before 6 months continued monthly, small groups, preferably between 10 and 20	Representative sample, representative ages at longer intervals. Sample size; 50 to 100 most effective
MCPC*	Emphasis on growth	Nutritional status
Response	Early home intervention based on local knowledge	Nutritional rehabilitation often with supplements
Interventions	Primary health care, ORT, vaccines, vitamin, deworming, etc.	Food supplementation
Referral	Check up in health centers	Rehabilitation, special care, if needed

Note: MCPC* [Mother and child protection card]

CM5.6: Enumerate and discuss important National Nutritional Programme.

Q15. Enlist community nutrition program available in India aimed to combat nutritional deficiency among children. *(TRIU, 2020, 2022; PBDSUHSH, 2018, DBRAUA, 2024)*

Community nutrition program available in India are as follows:

- Vitamin A prophylaxis program
- Prophylaxis against nutritional anemia
- Iodine deficiency disorders control program
- ICDS program
- Mid-day meal program

CM5.6: Enumerate and discuss Integrated Child Development (ICDS) Services Scheme.

Q16. What are the objectives of ICDS? What are the services provided/components of ICDS? Who are the beneficiaries under this program? *(WBUHS, 2013; AFUH, 2022; AKUB, 2022; BNMUB, 2012, 2013; TRIU, 2020; SSUHSA, 2022; PBDSUHSH, 2013, 2015; GITAMAP, 2023; RGUHS, 2012; SMU, 2012, 2014; RUJH, 2009, 2012; BUMP, 2013; NIMSUR, 2015; MU, 2019; KIMS, 2023; DBRAUA, 2024)*

Ans: This is one of the largest nutritional program in our country, which initiated on 2nd October, 1975.

The objectives of ICDS are to:

1. Improve nutrition and health status in the age group of 0–6 years.
2. Lay the foundation for proper physical, social and psychological development of children.
3. Reduce the incidence of morbidity, mortality, malnutrition and school drop outs.
4. Achieve effective coordination and implementation of policy amongst the various departments to promote child development.
5. Enhance the capability of the mother to look after normal health and nutritional needs of the child through proper nutrition and health education.

ICDS Scheme is the symbol of our country's commitment to its children and nursing mothers, as a response to the challenge of providing preschool non-formal education on one hand and breaking the vicious cycle of malnutrition, morbidity, reduced learning capacity and mortality on the other. These centers are manned by Anganwadi worker (AWW) and an Anganwadi helper (AWH).

Services provided by ICDS/Components of ICDS (Function of ICDS):

1. **Supplementary nutrition:** Beneficiaries—6 months to 6 years children, pregnant and lactating mothers up to first 6 months, adolescent girls. Supplementary nutrition should be given in the form of hot cooked food/ready to eat food **300 days** in a year irrespective of BPL/APL. Feeding should be supervised and proper hand washing should be practiced before and after feeding. Following amount of protein and calories should be supplied according to the norm.

Beneficiary	Calories/day	Proteins (g/day)
Children 6–72 months	500	12–15
Severely underweight children (6–72 months)	800	20–25
Pregnant women and nursing mothers	600	18–20

   Common hot cooked food supplied is khichri with egg, vegetables and iodized salt.
2. **Nonformal preschool education (NFPSE):** Beneficiaries—Children of 3–5 years.
   Objectives: To lay foundation for proper physical, social, psychological and cognitive development of children. This function is carried out by AWW about 2 hours in a day. This method is different from formal teaching. Children learn through play, singing rhymes, development of healthy habits, e.g., cutting nails, washing hands before meals, etc. Children are familiar with color, size, shape, etc. Materials used for children's activities include chalks, crayons, cut paper, paints, balls, toys, rings, clay and mud, etc. NFPSE also helps to enhancement of school enrolment and reduction of school dropout.
3. **Growth monitoring:** Weight of the under-five children are measured by AWW by Salter weighing machine at monthly interval from their birth onward and after the measurement, it is plotted in **WHO growth chart for boys and girls respectively** and nutritional status is classified into normal, moderately underweight and severely underweight. Mother is adequately explained about their child's nutritional status at monthly interval.
4. **Nutrition and health education (NHED):** Beneficiaries—Pregnant, lactating women, adolescent girl, women of 15–49 years. In rural AWC, it is implemented as a part of VHND at monthly interval. ANM or health worker can perform as health educator. In urban AWC, NHED is implemented as mother's meeting where AWW can perform as health educator.
5. **Immunization:** In rural AWC, it is implemented as a part of VHND as outreach session at monthly interval. ANM or health worker male can perform as vaccinator. Vaccines and other necessary equipment are supplied to AWC where children up to 15 years and pregnant woman received vaccines. In urban AWC, no outreach session is conducted. Immunization cards are reviewed by AWW at regular interval and she helps in mobilization of beneficiaries at designated immunization clinic at regular interval.
6. **Health check-up and referral service:** Health check-up of pregnant women, lactating mother and children are conducted at regular interval by AWW, ANM, health worker male, etc., for management of minor ailments. The following medicines are supplied at AWC:
   - Tablet and syrup Paracetamol
   - ORS
   - Tab cotrimoxazole
   - Povidone iodine ointment
   - Chloramphenicol eye drop
   - Albendazole tablet, etc.

Beneficiaries of ICDS scheme: *(ABKUB, 2023)*

1. Children under 6 years
2. Pregnant women and lactating mothers in their first 6 months
3. Adolescent girls
4. Women of 15–49 years

16a. A 2-year-old male child presented to the immunization clinic. His weight is between-2SD and -3SD for his age. What measures will you take for his management under the ICDS scheme? Enumerate the beneficiaries under the scheme. Discuss the services provided under this scheme *(WBUHS, 2024)*

Ans As the weight of the child is between -2SD and -3 SD so it is a case of moderate acute malnutrition (MAM).

Management under ICDS:

A. Supplementary nutrition :
   a. Energy, protein, fat , carbohydrate, calcium , zinc, iron, folate, vit a, vit B6 and vit B12 through Take Home Ration
   b. Under POSHAN Abhijan and Saksham Anganwadi—dietary diversity, food fortification and popularizing use of millets
   c. Millet needs to be mandatorily supplied at least once a week and suitably integrated in Take Home Ration (not raw ration) and hot cooked meal in palatable form

B. Nutrition, health education and counseling of mother including WASH .

C. Follow up

Beneficiaries: Ans from previous question

Services provided: Ans from previous question

CM5.6: Discuss National School Health Program.

Q17. Enumerate the objectives of school health program. Discuss briefly different aspects/components/ essentials of school health services. Write in brief about mid-day meal program.
(WBUHS, 2008, 2017, 2021; MGUB, 2022; ABKUB, 2019, 2023; VKSUAB, 2021; DU, 2013; SMU, 2013; RUJH, 2009, 2018; SSUHSA, 2016; RGUHS, 2010, 2012; KIMS, 2015; SDVPG, 2023)

Ans: The objectives of school health program are enumerated below:

- Promotion of positive health
- Prevention of diseases
- Early diagnosis, treatment and follow-up of the defects
- Awakening health consciousness in children
- Provision of healthful environment

The different aspects/components/essentials of school health services are as follows:

a. **Health appraisal of school children and school personnel**
   - *Periodic medical examination:* At the time of entry and thereafter every 4 years, in big cities medical examination are frequent, e.g., test eyes, hearing, speech as well as nutritional deficiencies.
   - Training of school personnel on health
   - *Daily morning inspection is very important:* The following clues will help the teacher in suspecting children who need medical attention: (i) usually flushed face, (ii) any rash or spots, (iii) symptoms of acute cold, (iv) coughing and sneezing, (v) sore throat, (vi) rigid neck, (vii) nausea and vomiting, (viii) red and watery eyes, (ix) headache, (x) chills, (xi) sleepiness, (xii) disinclination to play, (xiii) diarrhea, (xiv) pain in the body, (xv) scabies and ring worm and (xvi) pediculosis.

b. **Health screening and remedial measures:** Special clinic should be conducted exclusively for school children at the primary centers in the rural areas and in one of the selected schools or dispensaries for a group of about 5000 children in urban areas. The clinic days and time should be intimated to all the concerned schools. However, in view of limited health manpowers and large number of students to be screened.

   Following health conditions need to be screened:
   - **General health and personal hygiene:** Which includes measuring weight and height, computation of BMI, identification of underweight and obese children are important issues
   - Clinical/laboratory assessment of anemia
   - **Eye examination:** Eye should be checked for refractory error, night blindness, trachoma, conjunctivitis
   - **Ear discharge** and hearing problems should be checked

- **Dental problems** like dental caries and periodontal diseases should be ruled out
- **Common skin problems** like scabies, lice, etc., should be checked for
- **Disabilities** checked for visual, hearing, locomotor disability.

c. **Remedial actions at school:** This includes:
- Minor injuries and common illness can be treated at school using first aid kit
- Provision of spectacles, hearing aids or supporting equipment for children with disabilities
- Counseling of children with chronic health problems or children with disabilities
- School nurse or nodal teacher would be responsible for first aid and coordinating all such remedial actions with the health personnel identified for purpose.

d. **Healthful school environment:**
- *Location:* Centrally situated with proper access to road and fair distance from busy places, cinema, factories, railway tracts and market places.
- *Site:* Suitable high land, no dampness with proper drainage system.
- *Structure:* Nursery and secondary schools as far as possible be single storied. Exterior walls should have a minimum thickness of 10 inches and should heat resistant.
- *Classroom:* Verandahs should be attached to classroom. No classroom should accommodate more than 40 students.
- *Furniture:* It should suit the age group of students. It is desirable to provide single desks and chairs. Desks should be of **"minus type"**. Chairs should be provided with proper back-rests with facilities for desk work.
- *Doors and windows:* There should be cross ventilation.
- *Color:* Inside color should be white, be periodically white-washed.
- *Lighting:* Should have natural light.
- *Water supply:* There should be an independent source of safe and potable water supply which should be continuous distributed through taps.
- *Eating facilities:* There should be a separate room for preparation of mid-day meal.
- *Lavatory:* One urinal for 60 students and one larine for 100 students. There should be separate arrangement for boys and girls.

e. **Nutritional program associated with school health services:** It includes the following:
- *Mid-day meal program:* It has proven to improve school enrolment, retention in schools and level of learning achieved. It is also one of the important sources of access of the balanced diet for the poor child.
- *Mass deworming:* Mass deworming of children with single dose of albendazole (400 mg tablet) every 6 months.
- Siblings of student are also covered.
- Weekly iron and folic acid supplementation
- *Iron and folic acid tablet:* Students from class 1–5 are given IFA tablet containing 45 mg of elemental iron and 400 µg of folic acid in weekly dose throughout period, students from class 6–12 are given large IFA tablets containing 60 mg of elemental iron and 500 µg of folic acid in weekly doses throughout period and biannual dose of Albendazole (400 mg), one tablet. *(WBUHS, 2024)*
- *Iodized salt:* Mid-day meal preparation should use iodized salt. Encouraging students are asked to bring salt they use at home to school and get it tested for iodization serves a valuable means for health education.

f. **Health and nutrition education:** It is one of the most important components of school health program. There are different ways in which health education would be implemented.
- *Formal and curriculum based:* These include topics like personal hygiene, environmental sanitation, food
- hygiene, hand washing, balanced diet, etc.
- *Formal but outside curriculum:* School would have to provide health education on issues, such as life skill education, first aid instruction, etc.
- *Nonformal education approaches:* This includes interactive sessions with health staff, quiz competition, essay and drawing competition on specific days like no tobacco day.

g. **Support activities:**
   - *Planning for screening and referral:* A school-wise schedule or visit of the health personnel should be drawn up and communicated to the school authorities, students, parents and local government bodies well in advance, so that preparations can be made. After screening, the students found to be suffering from disease or abnormality are to be managed at the school itself or if required, referred to designated health facility.
   - *Equipment and supplies:* Health department shall arrange for supply of equipment like weighing scale, height measuring equipment, Snellen's chart, etc.

h. **Transport:** Adequate provision of funds should be made for providing transport, hiring vehicles for visit of health staffs to schools and to taker children for referral.

i. **Capacity building:** This involves training of nodal teachers, medical and paramedical personnel for screening, follow-up of referral, remedial action at school level and health education activities.

Supplementary Nutrition Program in India *(GOAU, 2022; MGUH, 2023; KIMS, 2023)*

Mid-day meal program: This program has been in operation since 1961 throughout the country. The major objective of the program is to attract more children for admission to schools and retain them so that literacy improvement of the children can be brought about.

The National Institute of Nutrition is of the view that the minimum number of feeding days in a year should be **250** to have the desired impact on the children.

The important **goals of mid-day meal program** are as follows:
- Reorientation of eating habits
- Incorporating nutritional into the curriculum
- Encouraging the use of local commodities
- Improving the school attendance as well as educational performance of the pupils

Model menu for mid-day school meal:

Foodstuffs	Gram/Day/Child
Cereals and millets	75
Pulses	30
Oils and fats	8
Leafy vegetables	30
Nonleafy vegetables	30

Broad principles for mid-day meals are to be followed:
- The meal should be a supplement and not a substitute to the home diet
- The cost of the meal should be reasonably low
- The meal should be such that it can be prepared easily in schools; no complicated cooking process should be involved
- As far as possible, locally available foods should be used
- The menu should be frequently changed to avoid monotony.

CM5.6: Enumerate and discuss National Nutrition Policy.

The National Nutritional Policy adopted in 1993 advocates a comprehensive intersectoral strategy for alleviating the multifaceted problem of malnutrition and achieving an optimal state of nutrition for all sections of the society. The policy seeks to make a balance between the short-term measures like direct nutrition interventions and long-term measures like indirect interventions institutional/structural changes, thus, creating an enabling environment and necessary conditions for improving nutritional and health status.

National nutritional goals by 2000 ad:
- Reducing in moderate and severe malnutrition among preschool children by half
- Reduction in chronic undernutrition and stunted growth in children
- Reduction in incidence of low birth weight to less than 10%

- Eliminate blindness due to vitamin A deficiency
- Reduction in iron deficiency anemia among pregnant women by 25%
- Universal iodization of salt for reduction of iodine deficiency disorder to 10%
- Giving due emphasis to geriatric nutrition
- Production of 250 million tons of food grains per year
- Improving household food security through poverty alleviation program
- Promoting appropriate diets and healthy lifestyles

a. **Direct intervention (short-term) measures:**
   - Nutritional interventions for specially for vulnerable groups
     - Expanding the safety net—UIP, ORT, ICDS; these services have a considerable impact on child survival and different grades of malnutrition
     - Improving growth monitoring in the age group of 0–3 years with participation from mothers.
     - Reaching adolescent girls through ICDS, make them ready for safe motherhood.
     - Ensuring better coverage of pregnant mothers to reduce incidence of low-birth-weight babies.
   - Fortification of essential foods
   - Popularization of low-cost nutritious foods
   - Control of micro-nutrient deficiencies among vulnerable groups

b. **Indirect intervention: Long-term institutional and structural changes**
   - Food security; ensure aggregate food security, per capita availability of **215 kg/person/year** of food grain needs to be attained
   - Improvement of dietary pattern through production and demonstration
   - Improving the purchasing power of the urban and rural poor and improving the public food distribution system
   - Access land reforms facilities for under-served population
   - Access to health and family welfare services
   - Knowledge on basic health and nutrition
   - Prevention of food adulteration
   - Nutritional surveillance
   - Monitoring of different nutritional program
   - Equal remuneration for women as per minimum wage policy
   - Improvement of literacy status specially women
   - Research into various aspects of nutrition, both consumption and supply side.

CM5.7: Describe food hygiene including food and milk borne diseases.

Q18. Food safety. *(WBUHS, 2016, 2017)*

Ans: **Food safety** is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards.

It is important for people to understand how their behavior and activities contribute to the safety of food and how they can decrease the risk of foodborne illness. From processes on the farm to practices in the kitchen, human activities play an important role in food safety.

Foodborne illnesses are usually infectious or toxic in nature and caused by bacteria, viruses, parasites or chemical substances entering the body through contaminated food or water. Foodborne pathogens can cause severe diarrhea or debilitating infections including meningitis.

Food safety and hygiene are crucial to reducing the risk of foodborne illnesses that may cause through biological hazards such as pathogenic bacteria, viruses, and parasites, or chemical hazards or natural toxins.

The main benefits of HACCP (Hazard analysis and critical control point) based procedures are:

- Saves your business money in the long-run
- Avoids you poisoning your customers

- Food safety standards increase
- Ensures you are compliant with the law
- Food quality standards increase
- Organizes your process to produce safe food.

Keeping your hands clean when handling food will help prevent foodborne illness. An important rule in food safety is to always wash our hands before we handle food. Our hands carry different pathogens that can contaminate food.

Food security: Food security is a condition related to the availability of food, and individuals' accessibility and affordability to it. There is evidence of being in use over 10,000 years ago, with central authorities in civilizations ancient China and ancient Egypt being known to release food from storage in times of famine. At the 1974 World Food Conference the term "food security" was defined with an emphasis on supply. Food security may be defined as "**availability at all times of adequate, nourishing, diverse, balanced and moderate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices**". Later definitions added demand and access issues to the definition. The final report of the 1996 World Food Summit states that food security "**exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life**".

Household food security exists when all members, at all times, have access to enough food for an active, healthy life. Individuals who are food secure do not live in hunger or fear of starvation. Food insecurity, on the other hand, is a situation of "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways". The 1996 World Summit on Food Security declared that "food should not be used as an instrument for political and economic pressure". According to the International Centre for Trade and Sustainable Development, failed agriculture market regulation and the lack of antidumping mechanisms cause much of the world's food scarcity and malnutrition.

Q18a. Food standards. *(ABKUB, 2007)*

Ans: Food standards are the parameters set to ensure quality of foodstuff.

Food standards:

A. **Codex alimentarius:**
- Codex Alimentarius Commission is a principal organ of the joint FAO/WHO food standard program.
- It has formulated food standards for international market and are accepted internationally.
- Food standards in India are based on the standards of Codex Alimentarius.

B. **PFA standards:**
- These are the standards laid down by the Prevention of Food Adulteration Act, 1954 by the Central Committee of the food standards to obtain minimum level of quality of food staff under Indian conditions.
- These standards are statutory and there is a legal backing to it.
- Any food staff not confirming to these standards is considered adulterated.

C. **Agmark standards:**
- These are the standards prescribed by the Directorate of Marketing and Inspection of Government of India.
- It gives an assurance of the quality of foodstuff
- Purely voluntary, expresses degree of excellence above PFA standards

D. **Indian standard institution (ISI):**
- These standards are prescribed by Bureau of Indian standards.
- It gives an assurance of good quality of the product.
- Purely voluntary, expresses degree of excellence above PFA standards.

Q19. Milk borne diseases. *(RGUHS, 2009; NU, 2013; ABKUB, 2018)*

Ans: Milk is effective vehicles for spread of many diseases. Factors are favoring milk as vehicle of infections.

- It serves a good medium for organism to grow.
- It is most commonly adulterated.

Sources of infection: Dairy milk, human handler and environmental factors like contaminated vessels and polluted water, etc.

Milk borne disease classification (FAO/WHO):

A. Diseases of animals transmitted to man through milk:

- *Primary importance:*
  - Tuberculosis
  - Brucellosis
  - Streptococcal infections
  - Staphylococcal enterotoxin poisoning
  - Salmonellosis
  - Q fever
- *Lesser importance:*
  - Cowpox
  - Foot and mouth disease
  - Anthrax
  - Leptospirosis
  - Tick-borne encephalitis

B. Diseases of man transmitted through milk:

- *Diarrheal diseases:*
  - Typhoid and paratyphoid fever
  - Shigellosis
  - Cholera
  - Enteropathogenic *Escherichia coli*
- *Nondiarrheal diseases:*
  - Streptococcal infections
  - Staphylococcal food poisoning
  - Diphtheria
  - Tuberculosis
  - Enterovirus
  - Viral hepatitis

Features of milk borne epidemics:

- Usual victims are children
- Simultaneous case presentation
- Similarity in clinical manifestations
- Confined to an area with common supply source of milk

Prevention:

A. **Primary prevention:**

- *Health promotion:* Health education of animal handlers about zoonosis and personal cleanliness and hygiene. Education about clean and safe milk.
- *Specific protection:*
  - Dairy hygiene: Milk house should be free from dust and flies. Animal must be free from diseases. Storage, bottling and chilling should be done in clean surroundings. Availability of laboratory for milk testing.
  - Pasteurization
  - Sterilization

B. **Secondary prevention:** Early diagnosis and treatment: Any epidemic of milk borne must be diagnosed early and treated. The source of epidemic must be identified and further cases should be prevented.

Q20. Pasteurization. *(WBUHS, 2016; ABKUB, 2015; BNMUB, 2020; PBDSUHSH, 2018; RGUHS, 2011, 2014; TDMGRMU, 2010, 2011; SSUHSA, 2010; SMU, 2014; NU, 2012)*

Ans: Milk borne diseases are an important public health problem in our country. One of the important strategies for prevention of milk borne disease is pasteurization. Pasteurization may be defined as heating the milk to such temperature and for such period of time as are required to destroy any pathogen that may be present while causing minimal change in composition, flavor and nutritive value.

Different methods of pasteurization:

- **Holder method:** In this process, milk is kept at 63–66°C for at least 30 minutes and then quickly cooled to 5°C. This method is recommended for small and rural community.
- **High temperature and short time (HTST) method:** In this method, milk is rapidly heated to a temperature of 72°C, is held at this temperature not less than 15 seconds and is then rapidly cooled to 4°C. This is now the most widely practiced method.
- **Ultra-high temperature (UHT) method:** In this method, milk is rapidly heated to 125°C for a few seconds. It is then rapidly cooled and bottled as quickly as possible.

Tests of pasteurized milk:

- **Phosphatase test:** The test is based on the fact that raw milk contains an enzyme called phosphatase which is destroyed on heating at a temperature which corresponds closely with the standard time and temperature required for pasteurization. At 60°C for 30 minutes, phosphatase is completely destroyed.
- **Standard plate count:** The bacteriological quality of pasteurized milk is determined by standard plate count. Most countries in the west enforce a limit of 30,000 bacterial counts per mL of pasteurized milk.
- **Coliform count:** Coliform organisms are usually completely destroyed by pasteurization and therefore their presence in pasteurized milk is an indication either of improper pasteurization and postpasteurization contamination.

Q21. How would you educate food handlers regarding handling of food? *(PBDSUHSH, 2013)*

Ans: Numerous diseases can be transmitted due to poor hygiene of the food handlers.

The diseases are as follows:

- Diarrhea
- Dysentery
- Enteric fever
- Enterovirus infection
- Viral hepatitis
- Protozoal or helminthic infections
- Streptococcal and staphylococcal infections
- Salmonellosis

Education for food handlers:

- **Hands:** The hands of a food handler should be clean at all times. They should be advised to scrub and wash hands as often as required and also immediately after visiting lavatory. They should be educated to trim finger nails frequently and keep them dirt free.
- **Hairs:** The hair of the food handlers should be covered specially females to prevent loose hair entering the foodstuff.
- **Habits:** Food handlers are educated to avoid, coughing and sneezing in vicinity of food, licking the fingers before picking up a food article, smoking or chewing pan or betel nut on food premises.
- **Health:** Food handlers with wounds, otitis media or skin infection should not be permitted to handle the food or utensils. A day-to-day health appraisal of food handler should be undertaken food handler should also inform about any illness in their family.

CM5.8: Describe and discuss the effects of additives and adulteration.

Q22. Food additives and food adulteration are not synonymous—Explain.

(WBUHS, 2013, 2019; BNMUR, 2022; PBDSUHSH, 2013; DBRAUA, 2024)

Food additives are defined as 'non-nutritious substances, which are added intentionally to food, generally in small quantity, to improve its appearance, flavor, texture and storage properties.' This definition also includes animal food adjuncts which may result in residues of human food and components of packing materials which may find their way into food.

Examples: Coloring agent (turmeric), Flavoring agent (vanilla), Sweeteners (saccharin) and Preservatives (sorbic acid, sodium benzoate).

Food adulteration *(SAMU, 2022; RUHI, 2024)*

It is the process in which the quality of food is lowered either by the addition of inferior quality material or by extraction of valuable ingredient. It not only includes the intentional addition or substitution of the substances but biological and chemical contamination during the period of growth, storage, processing, transport and distribution of the food products, is also responsible for the lowering or degradation of the quality of food products.

Food staff	Examples of common food adulterants
Cereals	Stone, sand, grit
Dals	Khesari dal
Milk	Water, starch
Ghee	Vanaspati
Butter	Starch, animal fat
Turmeric powder	Lead chromate powder
Black pepper	Dried seed of papaya
Chilli powder	Brick powder
Tea leaves	Husk of blackgram, refuse of tree leaves
Coffee seeds	Tamarind seeds
Baking powder	Citric acid
Honey	Sugar, jaggery
Sugar	Chalk
Mustard seed	Argemone seeds
Edible oil	Mineral oil
Ice cream	Starch, cellulose, washing powder
Sweets	Nonpermitted colors
Hing	Resins, gums

Food adulteration is more harmful for health than food additives. It may result in death, e.g., adulteration of mustard oil with argemone oil causing epidemic dropsy, that may result in death. So, they are not synonymous.

Q23. Food enrichment.

(RUHI, 2018, 2022)

Enrichment is defined as **"synonymous with fortification and refers to the addition of micronutrient to a food which is lost during processing."** When foods are processed, they often lose some of the important nutrients such as vitamins and minerals in the process. If food is leveled **"enriched"** then the vitamins/or minerals which were lost have simply been added back to it's original nutritional value. Many consumer think that **"enriched"** means that the foods has extra nutrients added to it which will make it more nutritious. That is not true. It has simply been restored to it's original state.

An **enriched food** is a product to which nutrients have been added. Typically, the added nutrients were present in the **food** in its original form but were removed at some point during processing. White bread is an example of an **enriched food** because certain vitamins are added after the bleaching process depletes them.

CM5.8: Describe and discuss the importance and methods of food fortification.

Q24. Food fortification. *(WBUHS, 2023; AKUH, 2022; AIKUH, 2022; BNMUH, 2014, 2022; RGUHS, 2010; TDMGRMU, 2014; PHOSUHSH, 2017; SMU, 2014; SSUHSA, 2018; RUHL, 2018, 2022; KIMS, 2023, 2024; DHRAUA, 2024)*

Ans: Fortification of food is a public health measure aimed at reinforcing the usual dietary intake of nutrients with additional supplies to prevent/control some nutritional disorders. WHO has defined food fortification as **"the process whereby nutrients are added to foods to maintain or improve the quality of the diet of a group, a community or a population".**

Program of demonstrated effectiveness of fortification of food and water are implemented. The following are **few examples**:

- Fluoridation of water as a prevention of dental caries
- Iodization of salt for combating the problem of endemic goiter
- Food fortification of milk with vitamin A and D

In order to qualify as **fortification**, the vehicle and the nutrient must fulfill the following **criteria**:

- The vehicle fortified must be consumed consistently as part of the regular diet by the relevant sections of population or total population.
- The amount of nutrient must provide an effective supplement for low consumers of vehicles, without contributing a hazardous excess to high consumer.
- The addition of nutrient should not cause it to undergo any noticeable change in taste, smell, appearance, consistency.
- The cost of fortification must not raise the price of the food beyond the reach of population in greatest need.

Q25. Iodization of salt is a good example of food fortification—Explain and justify. *(WBUHS, 2008, 2019; SMU, 2009)*

Ans: Iodine deficiency disorder is an important public health problem in our country, which can lead to goiter, cretinism, squint, nystagmus, neuromuscular weakness, mental retardation and affect a significant proportion of population. To combat this problem, potassium iodate is mixed with common salt, which is a good example of food fortification.

Fortification criteria mentioned in Q.24.

All the above-mentioned criteria are fulfilled in case of iodization of salt, so it is a good example of food fortification. Iodine content of the salt should not be less than 30 PPM at production level and 15 PPM at consumption level.

Q26. What are the problems of adolescents? Mention the national programs concerning improvement of adolescent health. Outline four important health educational messages for benefit of an adolescent girl. *(WBUHS, 2014, BNMUH, 2021; NU, 2016)*

Ans: **The problems of adolescents** are discussed below:
Referred to Chapter 10, Q.113

The **four important health educational messages** for benefit of an adolescent girl are:

1. No marriage before 18 years
2. Regular health check up in the nearest health facility
3. Maintain cleanliness and hygiene
4. Life skill education is a mandatory

Q27. Role of IEC in prevention and control of adolescent obesity. *(SSUHSA, 2017)*

Ans: IEC is having a great role in prevention and control of adolescent obesity.

- **Weight control is very important in this case:**
  - Range of BMI in the range of 18.5–24.9 throughout the adulthood
  - Those who are already overweight should accept reduction of 5–10% of body weight and it is recommended as an initial goal.

Health education message should include the above information.

- **The next is dietary modification:** The following message should be included in dietary changes:
  - Carbohydrate and fat should be reduced.
  - Fiber content in diet should be increased.
  - Most conventional diet for weight reduction are based on 1000 kcal daily model for an adult.
  - Basic concept is that food energy intake should not be greater than energy expenditure.
  - Patient's behavior and strong motivation is very important to lose weight.
- **Increased physical activities:**
  - Regular exercise is the key to increased energy expenditure.
  - 30 minutes exercise 5 days in week but gap should not be >2 days in week example, swimming and cycling is a good exercise.

Q28. Body Mass Index [BMI]. *(RGUHS, 2014; SAMU, 2015; TDMGRMU, 2011; SMU, 2014; NU, 2013)*/**BMI are the best of all indicators of obesity—Justify.** *(WBUHS, 2015, 2022; BNMUB, 2020)*

Ans: The widely used indicators for identification of obesity are BMI, Broca's index, ponderal index, skinfold thickness, waist circumference, waist-hip ratio, etc.

$$\text{Body mass index (BMI)} = \frac{\text{Weight (in kg)}}{(\text{Height in Meter})^2}$$

Classification of adults according to **BMI**

Classification	*BMI*	*Risks of comorbidities*
Underweight	<18.50	Low
Normal range	18.50–24.99	Average
Overweight	≥25.00	
Pre-obese	25.00–29.99	Increased
Obese class I	30.00–34.99	Moderate
Obese class II	35.00–39.99	Severe
Obese class III	≥40.00	Very severe

Sources: Considering the above-mentioned methods for assessment of obesity BMI is more specific and sensitive, can be easily applied in the field also. FAO/WHO used BMI table as international reference standards. **So. BMI is the best of all indicators of obesity.**

Q29. Enumerate different types of food toxicants and consequent diseases in India and their prevention. *(WBUHS, 2010; ABKUB, 2019; BNMUB, 2018; RUJH, 2011, 2022, 2023; DU, 2015; SMU, 2015; TDMGRMU, 2010; RGUHS, 2002, 2007)*

Ans: Food toxicants and related disease conditions are described below: *(SSUHSA, 2023; TRIU, 2023)*

Food toxicants	*Related diseases*
Beta oxalyl amino alanine (BOAA)—an associated toxin found in Khesari Dal	Neurolathyrism
Aflatoxins found in ground nut, maize, parboiled rice, wheat, etc. Toxins are produced by storage fungi Aspergillus flavus, parasiticus, etc.	Aflatoxicosis

Contd...

Contd...

Food toxicants	Related diseases
Ergot is produced by field fungus Claviceps fusiformis. Ergot is found in food grains such as bajra, rye, wheat, etc.	Ergotism
Argemone oil adulteration or contamination of mustard or other oil	Epidemic dropsy
Millet contaminated with Jhunjhunia seeds	Endemic ascites
Fusarium toxins found in food crops	Health hazards for livestock and man Research is going on to find out the toxin

Diseases due to food toxicants:

A. Neurolathyrism. *(WBUHS, 2017; RGUHS, 2008; SAMU, 2011; TDMGRMU, 2012, 2014; BUMP, 2012; KIMS, 2021; BNMUB, 2016, 2022, 2023; VKSUAB, 2016; MGUB, 2023; RUJH, 2023; VBUJH, 2023)*

Ans: Neurolathyrism is produced due to a toxin, **Beta Oxalyl Amino Alanine (BOAA)**, which is found in khesari dal (***L. sativus***).

Geographical area: Neurolathyrism is prevalent in regions where khesari dal is eaten (diet containing more than 30% of khesari dal over a period of 2–6 months), in the state like Madhya Pradesh, Uttar Pradesh, Bihar and Orissa. It was also reported from Maharashtra, West Bengal, Rajasthan, Assam and Gujarat.

Toxin: The toxin Beta Oxalyl Amino Alanine (BOAA) can be isolated in crystalline form and is water soluble. The toxin can cross blood brain barrier and affect the nervous system.

Clinical feature: The disease mainly affects the young men between the ages of 15–45 years and manifests its different stages.

- **Latent stage:** Individual is apparently healthy but when there is physical stress can exhibit ungainly gait. If the diet is withdrawn at this stage, complete remission can occur.
- **No stick stage:** At this stage, the patient walks without stick but walk with short jerky steps.
- **One stick stage:** The patient walks with a stick to maintain balance and overcome muscular stiffness.
- **Two stick stage:** Patients needs two stick (crushes) due to excessive bending of knee and crossed legs. The gait is slow and clumsy and walking for short distance tires the patient easily.
- **Crawler stage:** In final stage, knee cannot support the body weight, thus the erect posture become impossible. There is atrophy of thigh and leg muscles and patient is forced for crawling by throwing his weight on his hands.

Prevention and control:

- **Vitamin C prophylaxis:** Daily administration of 500–1000 mg of ascorbic acid for a week or so can repair the damage in certain instances.
- **Banning of the crop or its consumption:** It is an extreme but not feasible step.
- **Removal of toxin:**
  - *Steeping method:* Toxin is water soluble and it can be removed by soaking the dal in hot water for 2 hours and washing the dal again with clean water and let it dry before consumption.
  - *Parboiling:* It is similar to parboiling of rice where large quantity of dal is soaked in lime water over night followed by boiling.
- **Health education:** People must be educated about the dangers of consumption of khesari dal and need to know the removal of toxin.
- **Genetic approach:** Selective propagation and cultivation of strain of khesari dal which have very low levels of toxin.
- **Socioeconomic change:** Socioeconomic change or overall development can root out the problem.

B. Epidemic dropsy. *(TDMGRMU, 2016; ABKUB, 2015; RUJH, 2023, 2024)*

Epidemic dropsy is a clinical condition and this is caused by ingestion of argemone oil which contains a toxic **alkaloid sanguinarine**. The symptoms of epidemic dropsy consist of sudden noninflammatory bilateral

swelling of legs, often associated with diarrhea, dyspnea, cardiac failure, glaucoma and often death. The contamination of mustard or other oil with argemone oil may be accidental or deliberate. Seeds of argemone mexicana closely resemble mustard seeds. The plant has prickly leaves and bright yellow flowers. Crops of mustard are gathered during March and during this period, seeds of argemone also mature and likely to be harvested along with mustard seeds. Sometimes unscrupulous dealers mix argemone oil with mustard or other oils.

Prevention and control measures:

- Ensuring supply of pure mustard oil by the strict enforcement of Prevention of Food Adulteration Act. Presence of argemone oil in mustard oil can be detected by nitric acid test (can detect when the level of argemone oil is more than 0.25%) or paper chromatography test (if the concentration is as low as 0.0001%) hence the later one is very sensitive test. It is the duty of food inspector, to draw and dispatch the sample of suspected food article to the laboratory for testing. If the adulteration is proved, trader is awarded a minimum imprisonment of 6 months and a fine of ₹ 1000. If the adulteration results in grievous health problem or even death, punishment will go up to life imprisonment and a fine of ₹ 5000.
- If the disease becomes prevalent in a locality, the use of mustard oil should be avoided.
- **IEC**—Extensive public awareness should be carried out including health education about argemone seeds and oil. Signs, symptoms of epidemic dropsy should be clearly explained to the general population. Doctor, nutritionist, food inspector can perform as health educator.
- Testing of blood and urine for sanguinarine in suspected cases of dropsy should be done for confirmation and accordingly measures can be taken.
- All patients of epidemic dropsy should be monitored by various investigations including intraocular pressure recording to assess the presence of glaucoma.
- All packed cooking oil (mustard oil in particular) should have a label as "Argemone Free" by the manufacturing company.

C. Aflatoxins. *(TDMGRMU, 2009; RGUHS, 2011)*

Aflatoxins [virtue of its origin (A. flavis → Afla)] are group of mycotoxins produced by fungi, *Aspergillus flavus* and *A parasiticus*, which infest food grains like ground nut, maize, perboiled rice, sorghum, wheat, rice, cotton seed, etc. When stored under improper conditions, i.e., moisture level above 16% and temperature ranging from 11-37°C, toxins are highly produced.

Of the various Aflatoxins produced by fungus, B1 and G1 are most potent hepatotoxins and are also carcinogenic.

Prevention and control:

- Drying and proper storage to keep the moisture level below 10%.
- Contaminated food should not be consumed.
- Health education plays an important role.

C. Ergotism.

The ergot fungus *Claviceps purpurea* infests the food grains, such as bajra, rye, sorghum and wheat, during the flowering stage to grow as a blackish mass and seed becomes black and irregular and harvested along with the food grains. Consumption of such infected food grain leads to ergotism.

Clinical manifestations: Ergotism manifestations are acute, but rarely fatal and include nausea, repeated vomiting, giddiness and drowsiness extended for a period up to 1-2 days.

Chronic manifestation includes painful cramps in limbs and peripheral gangrene due to vasoconstriction.

Prevention and control:

- Ergot infested grains can be easily removed by floating them is 20% salt water.
- They can be removed by hand picking or air floatation.

E. Endemic ascites:

- It is a gastroenterological term for an accumulation of fluid in the peritoneal cavity that exceeds 25 mL.
- The staple millet-Panicum miliare, was found to be contaminated with seeds of *Crotalaria* species. Chemical analysis of the contaminating weed seeds showed the presence of hepatotoxic alkaloids of the monocrotaline type. On the basis of available evidence, it appears that the ingestion of the contaminating weed of *Crotalaria* species is causally related to the outbreak of the disease.
- Endemic ascites is produced due to pyrrolizidine alkaloid, a hepatotoxin found in the weed Jhunjhunia seeds (Crotalaria) which contaminate the millet *Panicum miliare.*
- It is endemic in Sarguja district of Madhya Pradesh affecting both sexes and all age groups, except infants manifesting as sudden onset of ascites and jaundice with over-all mortality of 40%.

Prevention and control:

- Health education
- Deweeding of Jhunjhunia plants
- Removing seeds of Jhunjhunia at household level as its seeds are considerably smaller than those of the millet.

F. Fusarium toxins:

- Fusarium species of field fungi are known to contaminate food crops specially sorghum and rice. They produce toxins and these may cause health problem.
- Exposure to mycotoxins occurs worldwide, even though there are geographic and climatic differences in the amounts produced and occurrence of these substances. Mycotoxins are secondary chemical metabolites of different fungi. They are natural contaminants of cereals, so their presence is often inevitable. Fusarium fungi produce a diversity of mycotoxin types, whose distributions are also diverse. The production of toxins is influenced primarily by environmental conditions, and crop production and storage methods. The amount of toxin produced depends on physical (viz., moisture, relative humidity, temperature, and mechanical damage), chemical (viz., carbon dioxide, oxygen, composition of substrate, insecticides and fungicides), and biological factors (viz., plant variety, stress, insects, spore load, etc.). Moisture and temperature have a major influence on mold growth rate and mycotoxin production. Among the most toxic and prevalent fusaria, toxins are the following: zearalenone, fumonisin, moniliformin and trichothecenes (T-2/HT-2 toxin, deoxynivalenol, diacetoxyscirpenol, nivalenol). The presence of mycotoxins in the animal diet can produce significant production losses.

Prevention and control: Any considerable presence of mycotoxins, in major dietary components, confirms the need to adopt a continuous prevention and control program.

SHORT NOTES AND RELEVANT QUESTIONS

Q30. Growth chart/Growth chart can play multiple roles—Explain.

(WBUHS, 2010; AKUB, 2019, 2022; VKSUAB, 2018; ABKUB, 2005, 2023; YSRUHSAP, 2023; RGUHS, 2010, 2012; TDMGRMU, 2013, 2015; SAMU, 2011; SSUHSA, 2012, 2021; KIMS, 2017, 2023; GNSUB, 2023; VNSGUS, 2024, DBRAUA, 2024)

Ans: The growth chart or "Road to health" chart is first designed by David Morley and later modified by WHO is a useful tool for detection of undernutrition. A joint **"Mother and Child Protection Card (MCPC)"** has been developed where WHO growth chart is attached for growth monitoring. So MCPC is integrated approach all activities has to be performed by mother and family are given as pictorial for better understanding of mother as well as health workers (ANM, AWW, ASHA, etc.)

Weights of the under-five children are measured by ANM, AWW, ASHA by Salter weighing machine and plotted in WHO growth chart for **boys (blue border)** and **girls (pink border)** respectively (**Figs. 5.2 and 5.3**) and nutritional status is classified into normal, moderately underweight and severely underweight. Mothers are adequately explained about their child's nutritional status. Ideally weight is measured monthly from birth to 1 year, every 2 months during the second year and every 3 months thereafter up to 5 years, as this age groups are greatest risk of **growth faltering**. For severe underweight babies, weights of the under-five children are monitored at fortnightly interval. Undernutrition is a major public health problem in our country due to several reasons and also a significant risk factor for various types of morbidities like diarrhea, ARI, etc.

It has three zones, green, yellow and red. Top part of the green zone corresponds to median of the weight-for-age of Multicentre Growth Reference Study (MGRS) standard, yellow and red zone corresponds to 2 standard deviations and 3 standard deviations below median respectively.

Nutritional status is classified as follows:

Weight for age plotted in the zone	*Nutritional status*
Green	Normal
Yellow	Moderately underweight
Red	Severely underweight

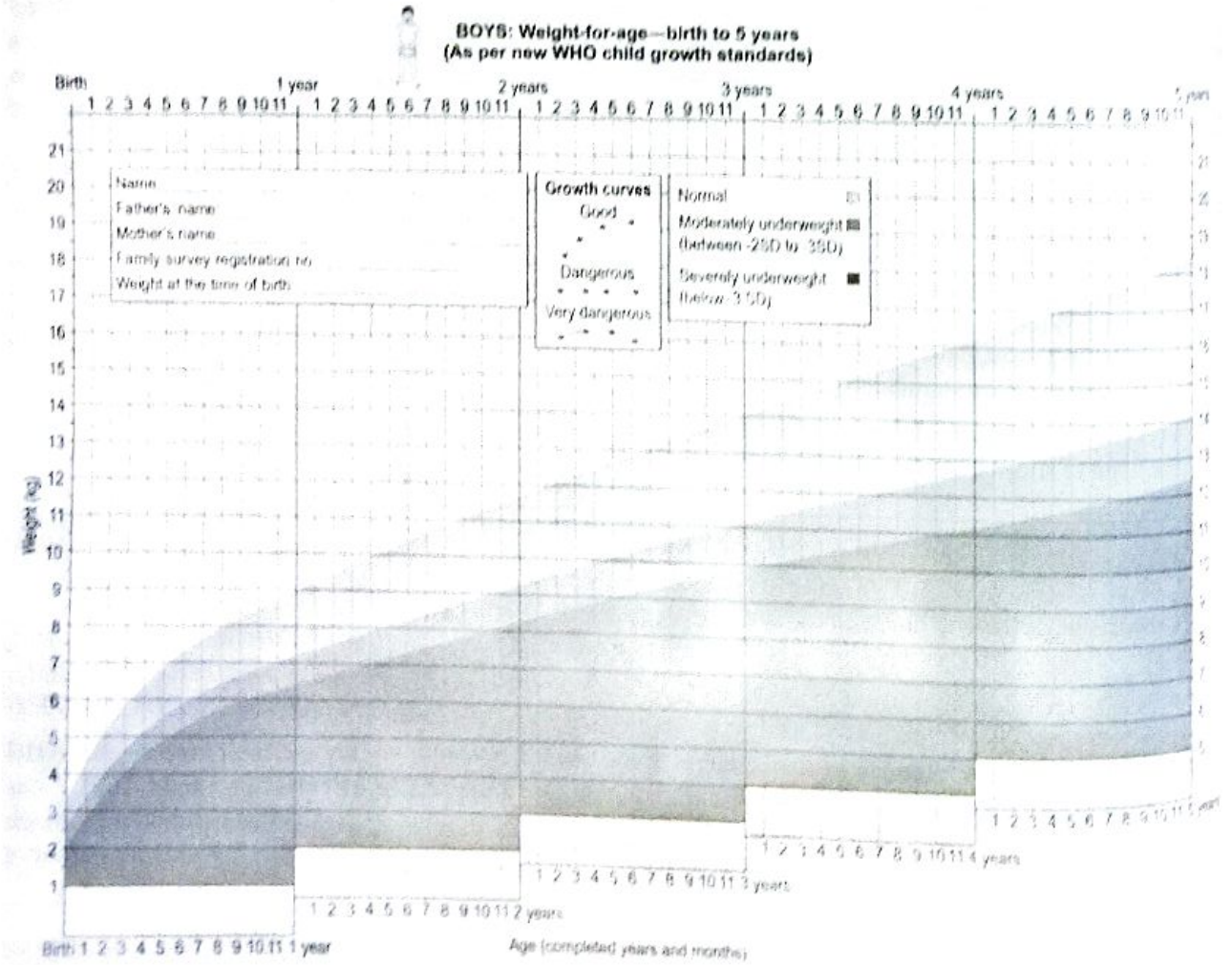

Fig. 5.2: Growth chart for boy.

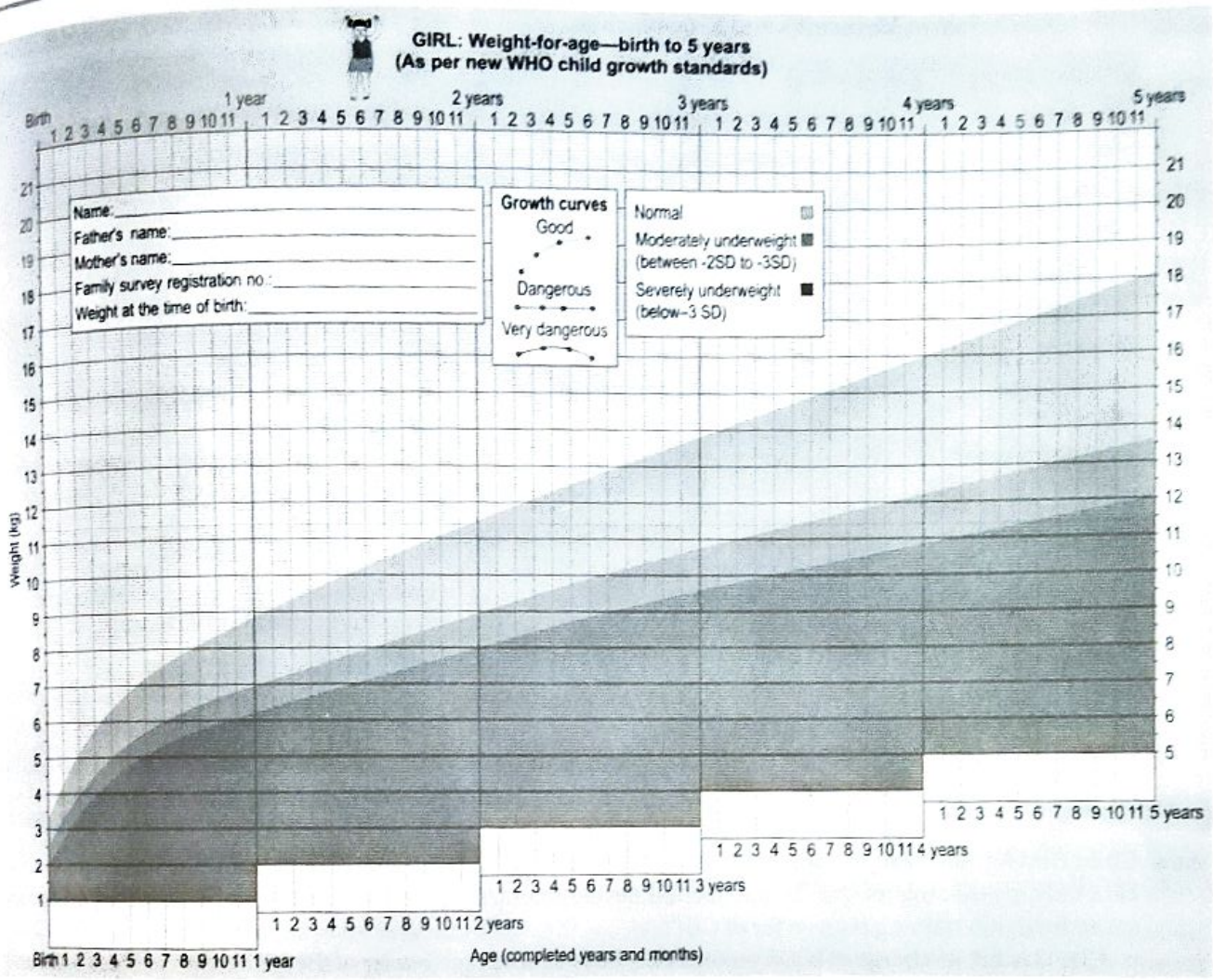

Fig. 5.3: Growth chart for girl.

Other uses of growth chart:

Diagnostic tool: Undernutrition can be detected long before signs and symptoms become apparent.

Planning and policy making: By grading undernutrition, it provides an objective basis for planning and policy making in relation to child health care at local and central level.

Educational tools: Because of its visual character, mother can be educated in the care of her own child and encourage her to participate more actively in growth monitoring.

Tools for action: It helps the health worker on the type of intervention that is needed, it will help make referral easier.

Evaluation: It provides a good method to evaluate the effectiveness of corrective measures and the impact of a program or of special interventions for improving child growth and development.

Tools for teaching: It can also be used for teaching, for example, the importance of adequate feeding, deleterious effect of diarrhea.

Uses of growth monitoring:

- To detect the undernutrition at the earliest and correct it by means of suitable intervention.
- To assess the nutritional status of young children over a period of time.
- To assess the weight gain pattern in different ages.
- To select the beneficiaries for supplementary and therapeutic nutrition.
- Useful tool for effective communication for behavior change.

Q31. Difference between Marasmus and Kwashiorkor. *(BUMP, 2012; NU, 2008; VKSUAB, 2019)*

Points of difference	Marasmus	Kwashiorkor
Age group	Common in children aged <5 years	Commonly seen in children aged 2–5 years
Diet	Inadequate intake of both protein and energy	Low protein/energy ratio
Growth	Mild retarded growth/underweight	Severe retardation in growth and development
Muscles	Muscle wasting (characteristic)	Weak and atrophic
Fat	Severe loss of subcutaneous fat	Fat often retained
Behavior	Very hungry and cries continuously	Apathy and anorexia
Appetite	Usually good	Poor
Diarrhea and vomiting	Common	Diarrhea almost always present become chronic and recurrent
Skin and mucous membrane	Skin is thin and attached to bone, bony prominence are marked, mucous membrane of mouth usually reddish	Patches of hyperpigmentation, ulceration seen in skin of legs, buttock and perineum **(Flaky paint dermatitis)**
Edema	Absent	Pitting edema, soft and painless
Hair	Hair thin and lusterless, pluckable	Hairs usually dry and thin, depigmentation and alternate pigmented hairs **(Flag sign)**
Facies	Typical face marasmic child compared to monkey facies or old man look	Moon facies
Biochemical findings	Serum albumin normal Blood urea normal	Serum albumin markedly reduced Blood urea reduced

Q32. CDPO. *(BNMUB, 2003)*

Ans: Child Development Project Officer (CDPO) played an important role in ICDS program. She should preferably be a lady, possessing master degree in child development/social work/home science/nutrition/any other allied field. Job training is given for of CDPOs.

- CDPO is the in-charge of ICDS project. She/he is to act as the leader of the ICDS team at block level and is responsible for implementation and supervision of the program as well as day to day administration.
- To allocate monthly and yearly target to each Anganwadi and release funds to them.
- Supervision and guidance of work of entire project team.
- Ensure various supplies to the project. For this purpose, she will maintain necessary links with district and state officials.
- To ensure that all equipment and material supplied and used, maintained and accounted for properly.
- To help Anganwadi workers in forming and operating village level coordination committee.
- Arrange educational programs with the help and assistance of other block personnel.

Q33. Anganwadi worker (AWW). *(BNMUB, 2002; RGUHS, 2010; ABKUB, 2015, 2023; SAMU, 2016; GOAU, 2022; VNSGUS, 2023)*

Ans: A multipurpose worker selected from local community, usually studied up to at least 10th standard. She is the local and focal person of ICDS service delivery.

- She is trained at PHC or other Anganwadi Training Center for 4 months in various aspect of health, nutrition and immunization, family planning, child development, mother and child health record keeping and also survey technique. She is a part time voluntary worker and is paid an honorarium of ₹ 7200.00 (Central share is ₹ 4500.00 and state share is ₹ 2700.00). AWW has been assisted by one helper who gets honorarium of ₹ 5300.00 (Central share is ₹ 3050.00 and state share is ₹ 2250.00).
- AWW caters about 170 children in 0–6 years age groups and 30 expected and 15 lactating mothers and adolescent girls.

- Anganwadi workers are the nucleus of ICDS programs. These centers cater a population of 400–800 in rural and urban slum population and 300–800 in tribal population.
- Anganwadi worker is the key person under ICDS program. She is a voluntary worker selected from the village/slum which she serves. She works for 4–5 hours in a day and 6 days for a week.

Functions of Anganwadi workers:

- Community survey and enlisting beneficiaries like children under 6 years of age, pregnant and lactating mothers.
- Record the weight of the children once in a month thus monitor growth of children by using separate male and female WHO growth chart. By plotting weight of the children detect early the normal, low underweight and severe underweight children.
- She prepares food daily and distributes among beneficiaries maintain supplementary feeding of children and mothers.
- Provides health and nutritional education to mothers and nonformal preschool education to children.
- Assisting ANM in immunization and organize VHND for children and pregnant women and find our drop out children and mother in her area.
- Conducting health check-up and treatment of common ailments, first aid and early detection and referral of severely underweight baby and referral for other health problems.
- Maintaining liaison with other institutions in village, e.g., Panchayat, Mahila Mandals, school teachers, etc.
- Organizing women's groups and Mahila Mandals.
- To guide ASHA engaged under NRHM.
- Provides Vitamin A syrup up to under 5 children and iron and folic acid to the beneficiaries.
- Maintains all records and assist supervisors to carry out day to day activities.
- Attends monthly meeting and submit report to CDPO.
- Coordinate with ASHA and other field level stuff, thus helps in different National Health Program like IPPI, etc.

Q34. Village Health and Nutrition Day [VHND]/Out-reach Clinic *(WBUHS, 2014, 2021; NU, 2014; RGUHS, 2024; GNSUB, 2023; MGUB, 2024)*

Ans: This has been proposed to be organized in AWC which acts as a platform for inter-sectoral convergence. It is expected that VHND if organized regularly and effectively can bring about the much needed behavior changes in the community and also include health seeking behavior of community.

The ASHAs, AWW and other grass-root workers should mobilize the villagers, especially women and children, to assemble at the nearest AWC on the scheduled day. On the VHND, villagers can interact freely with the health and nutrition personnel and obtain basic services and information.

Services provided at VHND:

- Immunization
- Nutrition and health education
- Health check-up
- Referral services, etc.

Q35. Supplementary nutrition and therapeutic nutrition are different—Explain. *(WBUHS, 2008, 2023; AKUB, 2022; MGUB, 2024)*

Supplementary nutrition	*Therapeutic nutrition*
Beneficiaries of supplementary nutrition of normal and moderate underweight babies under ICDS program	Beneficiaries of therapeutic nutrition of severe underweight babies under ICDS program
They receive 500 kcal and 12–15 g of protein per day (300 days in a year) from Anganwadi Centers	They receive 800 kcal and 20–25 g of protein per day
Beneficiaries of supplementary nutrition can be managed at home	Beneficiaries of therapeutic nutrition can be managed at home

Q36. Write briefly about the recommended dietary goals. *(RGUHS, 2011, 2013; TDMGRMU, 2008, 2012)*

Ans: Dietary goals are the set of recommendations made by the WHO expert committee which forms the framework for formulating a balanced diet for an individual. A diet satisfying these goals is called "Prudent diet".

Recommended dietary goals (WHO)

- Dietary fat should be limited to approximately 20–30% of total daily intake.
- Saturated fats should contribute no more than 10% of total energy; unsaturated.
- Vegetable oils should be substituted for the remaining fat (New Guidelines = <7%).
- Excessive consumption of refined carbohydrate rich in natural fiber should be taken.
- Sources rich in energy such as fats and alcohols should be restricted.
- Salt intake should be reduced to an average of not more than 5 g per day.
- Protein should be approximately 15–20% of daily intake.
- Total cholesterol intake through diet should be not exceed 200 mg per day.

However, these conditions may not be applicable for special groups like pregnancy, lactating mothers and medical disorders like diabetes.

Q37. Parboiled rice is nutritionally superior to milled rice—Justify. *(WBUHS, 2011, 2018, 2021)*

Ans: Parboiling is technique of preserving the nutritive value of rice by partial cooking in steam. The technique is recommended by Central Food Technological Research Institute, Mysore known as hot soaking process. The process starts with soaking the paddy (unhusked rice) in hot water at 65–70°C for 3–4 hours. This process swells the grain followed by draining of water and steaming the soaked paddy in the same container for 5–10 minutes. The paddy is then dried and later home pounded or milled.

During the steaming process, a greater part of vitamins and minerals present in the outer aleurone layer are driven in the inner endosperm. With subsequent milling even to a high degree, the nutrients are not removed. During the drying process, the germ gets attached more firmly to the grain, heating hardens the rice grain and more resistant to insect invasion and more suitable for storage than row rice. The starch gets gelatinized which improves the keeping quality of rice. Only disadvantage is off smell.

On the other hand, milling process deprives its nutritive value. It loses up to 15% of protein, 75% of thiamine and 60% of riboflavin and niacin. People subsisting on white or polished rice are prone to beriberi.

Again, during the process of washing and cooking, further loss of essential nutrients is observed. By washing removed 60% of water-soluble vitamins and minerals. Further draining of excess water at the end of cooking leading to loss of vitamin B groups is seen.

So, considering the fact, nutrition workers advocate parboiled rice.

Q38. Nutritional profile of cereals. *(ABKUB, 2007)*

Ans: Cereals are main source of carbohydrate, 6–12% protein, minerals and vitamin B complex. It provides 350 kcal per 100 g. Considering the large amounts it contribute 70–80% of total energy intake and more than 50% of protein intake in typical Indian diets. Cereal proteins deficient in lysine, threonine and pulse proteins is deficient in methionine. When cereal and pulse protein mixed together they act as complete protein. **Example: Khichuri (Poor man's meat).**

Q39. Balanced diet. *(WBUHS, 2017, 2020, 2021, 2023; BNMUB, 2020, 2023; RGUHS, 2012, 2013; TRIU, 2014, 2013, 2022; SAMU, 2008; TDMGRMU, 2008, 2012; KIMS, 2015, 2023; SSUHSA, 2016; SMU, 2015, 2010; GOAU, 2023; VNSGUS, 2023)*

Ans: Balance diet may be defined as one which contains a variety of foods in such quantities and proportion, that the need for energy, amino acid, vitamins, minerals, fats, carbohydrate and other nutrient is adequately met for maintaining health, vitality and general well-being and also makes a small provisions for extra nutrients to withstand short duration of leanness.

In constructing balanced diet, the following principles should be borne in mind (Criteria of it):

- The daily requirement of protein should be met. This amount is 10–15% of the daily energy intake.
- Next is the fat requirement, which should be limited to 15–30% of the daily energy intake.
- Carbohydrates rich in natural fiber should constitute the remaining food energy. The requirement of micronutrients should be met.

The dietary pattern varies widely in different parts of world. It is generally developed around the kinds of food produced depending upon the climatic condition of the region, economic condition, religion, customs, taboos, taste and habits of the people.

Q40. Prudent diet. *(WBUHS, 2020)*

Ans: A diet to protect against heart disease, stroke, and other common diseases. It consists of fruits, vegetables, whole grains, legumes, nuts, fish, and low fat dairy products rather than refined or processed foods, red meats, high concentrated sweets, eggs, and butter. A multistep approach decreases fat, cholesterol, and protein.

- Dietary fat should be limited to approximately 15–30% of total daily intake
- Saturated fat should contribute no more than 10% of total energy intake, remaining fat should be unsaturated vegetable oils
- Protein should be 1 gm per kg body weight per day
- Excessive consumption of refined carbohydrate should be avoided
- More dietary fiber should be recommended about 15 gm/1000 kcal
- Alcohol should be restricted to 60 mL/day for women and 120 mL/day for men
- Salt intake should be 5 g per day
- Junk/fast food should be avoided

Special diet recommended for pregnant and lactating mother, for physically active person and medical conditions like diabetes, hypertension, etc.

Q40a Discuss Food-guide Pyramid. *(GOAU, 2023)*

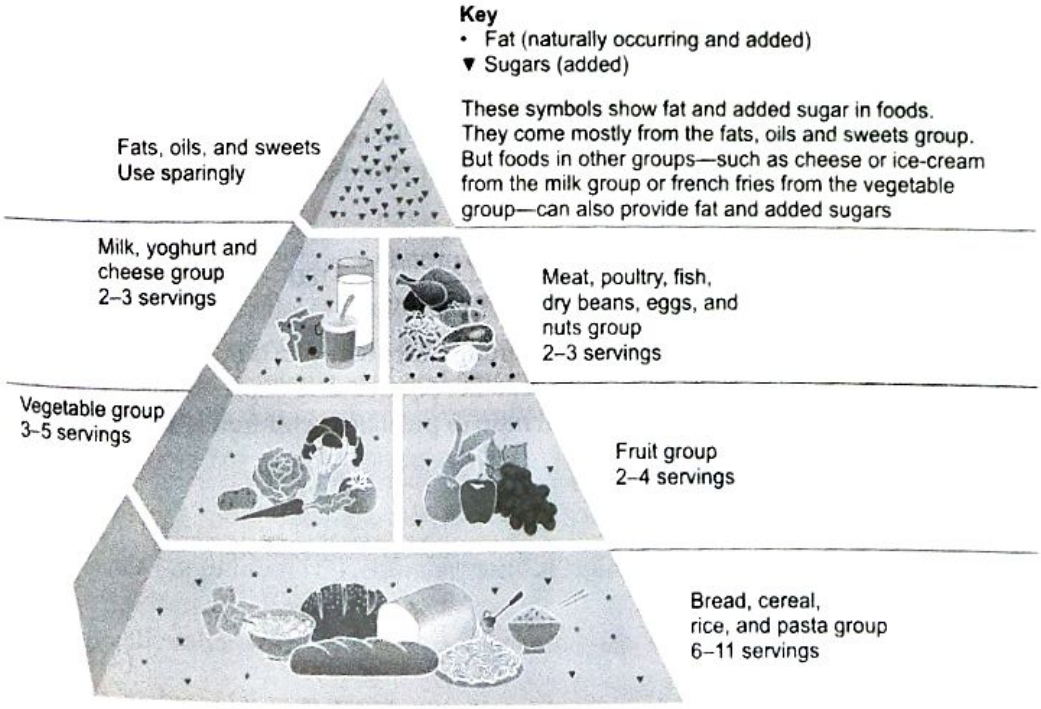

Fig. 5.4: Figure of Food-guide Pyramid.

Q41. What is the meaning of a reference protein? *(RGUHS, 2001; ABKUB, 2015; BNMUB, 2022)*

Ans: Reference proteins are the proteins with net protein utilization (NPU) of 100%. These proteins provide amino acids in exactly the same quantity as required by the body. They are perfect for body building.
Example: Egg protein is a reference protein with NPU of 96.

Q42. How will you assess quality of protein? *(WBUHS, 2016, 2022; ABKUB, 2018; RUJH, 2013; RGUHS, 2024)*

Ans: Protein requirements vary from individual to individual. Apart from age, sex and other physiological variables and factors like infection, worm infestation, emotional disturbances and stress situations can affect a person's protein requirement.

Assessment of protein:

- **Protein quality:** The quality of protein is assessed by comparison to the **"reference protein"** which is usually egg protein. There are two methods for assessment of protein quality—Amino acid score and net protein utilization (NPU).
  - *Amino acid score:* It is a measure of concentration of each essential amino acid in the test protein expressed as a percentage of that amino acid in the reference protein.

$$\textbf{Amino acid score} = \frac{\text{mg of amino acid per gram of test protein}}{\text{mg of the same amino acid per gram of reference protein}} \times 100$$

The amino acid score is somewhere between 50 and 60 for starches and 70 and 80 for animal foods.

  - *Net protein utilization (NPU):* *(KIMS, 2015)*
It is the product of digestibility coefficient and biological value divided by 100. The NPU gives a more complete expression of protein quality than the amino acid score. It is a biological method that requires special laboratory facilities.

$$\textbf{NPU} = \frac{\text{Nitrogen retained by the body}}{\text{Nitrogen intake}} \times 100$$

In calculating protein quality, 1 g of protein is assumed to be equivalent to 6.25 g of N.
The protein requirement varies with the NPU of dietary protein. If the NPU is low, protein requirement is high and vice versa. The NPU of the protein of Indian diets varies between 50 and 80.

- **Protein energy ratio:** The protein contents of many Indian foods has been determined and published in food consumption tables. One way of evaluating foods as source of protein is to determine what percent of their energy value is supplied by their protein content. This is known as **Protein Energy Ratio (PE ratio)**.

$$\textbf{PE ratio} = \frac{\text{Energy from protein}}{\text{Total energy in diet}} \times 100$$

This concept is useful because in many population groups adequate diet is not consumed to meet energy needs, resulting in energy deficits. The ratio of protein requirement, expressed as the ratio of protein calories to energy requirement. For example, PE ratio of preschool children is 4.6 and adult sedentary man 8.5.

Q42a. Essential amino acids. *(SMU, 2014, 2013)*

Ans: a. Leucine, b. Isoleucine, c. Lysine, d. Methionine, e. Phenylalanine, f. Threonine, g. Valine, h. Tryptophan, i. Histidine and j. Arginine

Q43. Limiting amino acids. *(TDMGRMU, 2011)*

Ans: A limiting amino acid is one that is not found in food. If a food has all amino acids, it is said to have its complete protein. Animal proteins are complete because it contains all essential amino acids. Plant proteins are usually incomplete because it does not contain all essential amino acids. **Protein of nuts is incomplete because lysine is deficient in nuts. Here lysine is a limiting amino acid.**

Q44. Combining rice and pulse in diet is a good practice. *(WBUHS, 2019)*/**Supplementary action of protein.** *(MGUB, 2022; SAMU, 2022, AKUB, 2023)*

Rice and dal consumed together provides better nutrition—Explain *(SSUHSA, 2023)*

Supplementary action of protein will qualify vegetable proteins into animal proteins—Explain *(AKUB, 2023)*

Ans: Cereal proteins are deficient in **lysine and threonine** and pulse protein deficient in **methionine**. When two or more of vegetarian foods are eaten together, for example, rice (cereal) and dhal (pulse) combination their protein supplement one another. Thus, they can be compared to animal protein in respect to essential amino acid. Thus, rice and pulse when mixed it called **"Khichuri"** in Indian context. **In respect to amino acid content, it is called Poor man' s meat.**

Q45. Name important sources of dietary fiber/dietary fiber play beneficial role in health. *(WBUHS, 2024; RGUHS, 2001; PBDSUHSH, 2017; TDMGRMU, 2015, 2016; MGUB, 2023, 2024)*

Ans: Dietary fibers are nonstarch polysaccharides which are inert components of carbohydrates with little nutritive value. It includes cellulose and noncellulose polysaccharide such as hemi-cellulose, pectin, storage polysaccharide like inulin and plant gums and mucilage.

Sources:
- Vegetable especially green leafy vegetables
- Fibrous food like pineapples and apple
- Brans
- Whole grains
- Cereals and pulses

Recommended intake: A daily intake of about 40 g of dietary fiber per 2000 kcal is desirable.

Functions of dietary fibers:
- It adds to bulk of food, favors satiety, increase transit time of food in the gut
- Reduces tendency of constipation
- Reduces incidence of coronary heart disease
- Reduces incidence of stomach, breast and prostate cancer
- Reduces incidence of colonic polyps, invasive colon cancer
- Reduces blood glucose and cholesterol level

Q46. Name of essential fatty acid, its dietary source and enumerate their functions. *(BNMUB, 2003; RGUHS, 2003; KIMS, 2015)*

Ans: Essential fatty acids are those that cannot be synthesized by human. They can be only derived from food. The most important essential fatty acid is linoleic acid, which serves as a basis for the production of other essential fatty acids (linolenic acid and arachidonic acid). Linoleic acid is abundantly found in vegetable oils. following are the dietary source of essential fatty acid:

Essential fatty acid	Dietary source
Linoleic acid	Safflower oil, corn oil, sunflower oil, soyabean oil, groundnut oil, mustard oil, palm oil, coconut oil
Linolenic acid	Soyabean oil, leafy greens
Arachidonic acid	Meat, egg, milk

Clinical manifestations of the deficiency of essential fatty acid, skin lesions like phrynoderma, etc., are found.

Q47. Who is an Indian reference man? *(ABKUB, 2023; RGUHS, 2002; PBDSUHSH, 2013; TDMGRMU, 2014; DU, 2013)*

Ans: An Indian reference man is aged between 19–39 years and weight **65 kg** with a height of 1.77 meter and BMI of 20.75, is physically fit for active work and free from disease. On each working day, he is engaged in 8 hours

of occupation in moderate activity, 8 hours in bed, 4-6 hours in sitting and moving about and 2 hours in working and in active recreation or household duties.

Q48. Indian reference women. *(TDMGRMU, 2013; DU, 2013)*

Ans: An Indian reference woman is aged between 19-39 years, nonpregnant and nonlactating and weight **55 kg** with a height of 1.62 meter and BMI of 20.95, is physically fit for active work and free from disease. On each working day, she is engaged in 8 hours of occupation in moderate activity, 8 hours in bed, 4-6 hours in sitting and moving about and 2 hours in working and in active recreation or household duties.

Q49. Enumerate the components of IYCF. Write down step of counseling of a women with a 3 months old child and complaining of "not enough milk". *(WBUHS, 2019; TRIU, 2020)*

Ans: The components of infant and young child feeding practices are enumerated below:

Initiate breastfeeding within about one hour of birth:

- Takes advantage of the newborn's intense suckling reflex and alert state
- Stimulates breast milk production
- Serves as the baby's first immunization. The infant will immediately benefit from the antibodies present in colostrum (the first milk)
- Minimizes maternal postpartum hemorrhage
- Fosters mother-child bonding

Establish good breastfeeding skills (proper positioning and attachment and effective feeding):

- Baby should be held close to the mother, facing the breast with the baby's ear, shoulder and hip in a straight line.
- Infant's mouth should open wide just before attaching so that the nipple and as much of the areola as possible are in mouth. If properly attached, the lips are rolled outward, with the tongue over the lower gum.
- To encourage effective suckling and to prevent the introduction of contaminants, no bottles or pacifiers should be used.
- If a mother has to miss a breastfeed, she can maintain her supply by expressing milk when she would have breastfed. Expressed breast milk can be fed by a cup at a later time.

Breastfeed exclusively (no pre-lacteal feeds, no other foods, no water or other liquids) for about the first 6 months:

- Breast milk completely satisfies an infant's nutritional and fluid needs for about the first 6 months. Infants do not need water or other liquids to maintain good hydration, even in hot climates. The potential dangers of water supplementation include the introduction of contaminants and reduced nutrient intake.
- Exclusively breastfed children are at a much lower risk of infection from diarrhea and acute respiratory infections than infants who receive other foods.

Practice frequent, on-demand feeding, including night feeds (8-12 breastfeeds per 24 hours, every 2-3 hours or more frequently if needed.

Indicators of adequate breastfeeding: If a baby urinates at least six times in 24 hours, this is a sign that breast milk intake is adequate.

Continue on-demand breastfeeding and introduce complementary foods beginning around 6 months of age.

Q50. Complementary feeding. *(ABKUB, 2009; NU, 2014)*

- Introduce complementary foods at 6 months of age (180 days) while continuing to breastfeed.
- Maintenance of breastfeeding continue frequent, on-demand breastfeeding until 2 years of age and beyond.

- Safe preparation and storage of complementary foods practice good hygiene and proper food handling by: (a) washing caregivers' and children's hands before food preparation and eating, (b) storing foods safely and safely and serving foods immediately after preparation, (c) using clean utensils to prepare and serve, (d) using clean cups and bowls when feeding children and (e) avoiding the use of feeding bottles, which are difficult to keep clean.
- Amount of complementary food needed start at 6 months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding.
- Gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities.
- Meal frequency and energy density—Increase the number of times that the child is fed complementary foods as s/he gets older. For the average healthy breastfed infant, meals of complementary foods should be provided 2–3 times per day at 6–8 months of age and 3–4 times per day at 9–11 months and 12–24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1–2 times per day as desired.
- Nutrient content of complementary Foods—Feed a variety of foods to ensure that nutrient needs are met. Vitamin-A rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content.
- **Feeding during and after illness:** Increase fluid intake during illness, including more frequent breastfeeding and encourage the child to eat soft, varied, appetizing and favorite foods. After illness, give food more often than usual and encourage the child to eat more.
- Growth monitoring and promotion, weighing the child regularly and plotting the weight on the health card is an important tool to monitor the growth of the baby. It is important to weigh all infants and young children every month in front of their mothers/caregivers and the growth status of the child should be explained.

Q51. What is weaning? Give an account of supplementary feeding for infants aged 6 months to 1 year. Outline logical and concise guidelines to weaning.

(BNMUB, 2010, 2014; TDMGRMU, 2010, 2013; SSUHSA, 2010)

Ans: Definition of weaning: Gradual introduction of semisolid, solid or soft food in addition to breast milk at the age of 6 months.

Rationality: According to the guidelines of Infant and Young Child Feeding (IYCF) practices, breast milk alone is the ideal food in the first 6 months. **But after 6 months, breastfeeding should be supplemented with nutritionally adequate, age appropriate, safe complementary foods like khichri, mashed potato with oil, egg, banana, mashed rice, etc., which are locally available and cheap. This should be prepared at home.**

In different age group, different amount of food should be provided according to **minimum meal frequency.**

Age group	Amount
6–11 months	1 katori (150 gm) of food 3 times in a day in breastfed children/1 katori (150 gm) of food 5 times in a day in nonbreastfed children
12–23 months	One-and-a-half katori of food 5 times in a day

Minimum dietary diversity: It is an important term related to minimum dietary diversity. According to the guidelines, following four types of food group should be consumed by the 6–23 months of children from the following seven types of food groups:

1. Legumes, nut
2. Root, grain, tuber
3. Egg
4. Dairy products
5. Flesh foods
6. Vitamin A rich fruits and vegetables
7. Other fruits and vegetables

Outline of logical and concise guidelines to weaning: The term **'Weaning' has been replaced by 'complementary food'**. Only milk is not enough for supplying the required energy of the child. In this age, extra food should be added to the breast-milk. This extra food should be energy dense. The extra food will not be milk or other liquid food. This will be solid or semi-solid in consistency. If these later conditions are fulfilled then only food will provide enough amount of energy. The food should be prepared for the baby in different way at home. So the baby will not face any injury by food. The poor family can provide this food if raw food is bought from parents community market. This will be cheaper also. These principles should be followed for complementary food.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **ICDS program came into existence in:** *(BNMUB, 2003, 2004; TRIU, 2023)*
   a. 1972 b. 1974 c. 1975 d. 1976

2. **ICDS scheme is a very good example of:** *(ABKUB, 2019; DBRAUA, 2024)*
   a. Intersectoral coordination b. Appropriate technology
   c. Epidemiological surveillance b. Philanthropic system

3. **School Health Committee (1961) recommended the mid-day school meal should provide minimum of following percentage of child's daily protein requirement:** *(ABKUB, 2004)*
   a. 25% b. 33% c. 50% d. 65%

4. **The population served by a AWC in tribal area is:** *(GITAMAP, 2023)*
   a. 300-800 b. 800-1600 c. 1600-2400 d. >2400

5. **Under ICDS scheme, pregnant women gets ---------- calories.** *(GITAMAP, 2023)*
   a. 500 b. 600 c. 700 d. 800

6. **Population usually covered by Anganwadi worker is:** *(ABKUB, 2007)*
   a. 500 b. 1000 c. 1500 d. 2000

7. **School health program incorporate components:**
   a. Teaching learning b. Nutrition c. Health care d. All of the above

8. **The simplest and common tool for assessing growth and nutritional status is:** *(BNMUB, 2004)*
   a. Height b. Arm circumference c. Weight d. Skin folds

9. **Which index of obesity does not include height?**
   a. BMI b. Ponderal index c. Broca's index d. Corpulence index

10. **Height (in cms) divided by cube root of body weight (in kgs):** *(GITAMAP, 2023)*
    a. Ponderal index b. Quetelet index c. Broca's index d. Chandlers index

11. **Who are the mid-day meal scheme beneficiaries?** *(ABKUB, 2021)*
    a. Class I-V b. All adolescents c. Preschool to class VIII d. Class V-X

12. **WHO defines adolescent age between:** *(ABKUB, 2021; DBRAUA, 2024)*
    a. 10-19 years of age b. 10-14 years of age c. 10-25 years of age d. 9-14 years of age

13. **The adolescent age group is defined as:** *(ABKUB, 2007)*
    a. 9-14 years b. 10-14 years c. 10-19 years d. 14-21 years

14. **"Kishori Shakti Yojana" has been designated to improve nutritional status of:** *(ABKUB, 2016)*
    a. Adult man b. Adolescent girls c. Under five children d. Senior citizen

15. **Consumption unit, the coefficient of dietary intake for an adolescent is of value:** *(TRIU, 2023; VNSGUS, 2023)*
a. 0.9 b. 1.0 c. 1.2 d. 1.7

16. **For growth monitoring of a child aged 2 years, it is advised to weigh the child periodically at following interval:** *(ABKUB, 2007)*
a. Fortnightly b. Monthly c. 2 monthly d. 3 monthly

17. **Which of the following cereals contains the best quality of protein?** *(ABKUB, 2016)*
a. Wheat b. Maize c. Rice d. Jowar

18. **Among the following pulses which has got highest protein contents:** *(ABKUB, 2005)*
a. Bengal gram b. Red gram c. Black gram d. Khesari dal

19. **Lathyrism is due to consumption of:** *(ABKUB, 2018)*
a. Red gram dhal b. Contaminated groundnuts
c. Bengal gram dhal d. Khesari dhal

20. **Sanguinarine causes:** *(AKUB, 2022)*
a. Lathyrism b. Epidemic dropsy c. Endemic ascites d. Ergotism

21. **Which one of the following contains maximum iron?** *(ABKUB, 2002)*
a. Dates b. Grapes c. Guava d. Banana

22. **Iron content in IFA given to the pregnant mother:** *(AKUB, 2022)*
a. 50 mg b. 60 mg c. 70 mg d. 40 mg

23. **RDA for vitamin D in adults:** *(AKUB, 2022)*
a. 500 IU b. 600 IU c. 700 IU d. 800 IU

24. **In a population of 10,000, beta carotene was given to 6000. It was not given to remainder. 3 out of the first group got lung cancer while 2 out of the other 4000 also got lung cancer. Which of the following is the best conclusion?** *(ABKUB, 2015)*
a. Beta carotene and lung cancer have no relation to one another
b. The p value is not significant
c. The study is not designed properly
d. Beta carotene is associated with lung cancer

25. **Vitamin A deficiency can cause all of the following, *except*:** *(TRIU, 2023)*
a. Night blindness b. Seborrheic dermatitis c. Respiratory infection d. Bitot's spots

26. **Criteria for xerophthalmia in India:** *(AKUB, 2022)*
a. Corneal ulcer 1% b. Night blindness >1%
c. Conjunctival Xerosis >1% d. Bitot spot 1%

27. **Highest vitamin A content is seen in:** *(ABKUB, 2020)*
a. Lemon b. Green leafy vegetables c. Tomato d. Ragi

28. **Dose of Vitamin A at 11 months of age is:** *(BNMUB, 2003; SSUHSA, 2023)*
a. 50000 IU b. 100000 IU c. 150000 IU d. 200000 IU

29. **The age group selected for vitamin A prophylaxis for:** *(ABKUB, 2003)*
a. Infant b. 3–5 years c. 1–5 years d. 1–3 years

30. Prevalence of vitamin A deficiency in a community is assessed as:
a. Night blindness 10%
b. Corneal ulcer 0.01%
c. Bitot's spots 0.5%
d. Decreased serum retinol level 0.05%

31. Prophylactic administration of vitamin A in a child is:
a. Health promotion b. Treatment c. Specific protection d. Rehabilitation

32. Pellagra:
a. Is due to pyridoxine deficiency
b. Occurs with diet chiefly on maize
c. Night blindness is a presenting feature
d. Causes high output cardiac failure

33. Dietary allowance of vitamin C is:
a. 40 mg per day b. 20 mg per day c. 30 mg per day d. 50 mg per day

34. Which cooking oil has the highest amount of essential fatty acid?
a. Ground nut oil b. Coconut oil c. Sunflower oil d. Castor oil

35. Reference protein is:
a. Milk b. Meat c. Egg d. Pulses

36. True about Indian reference male is:
a. Age 18–29 years b. Weight 65 kg c. Sedentary worker d. Works for 11 hours

37. Under NIDDCP when do you call iodine deficiency is a major public health problem:
a. Urinary iodine excretion rate <100 µg/L
b. Urinary iodine excretion rate >100 µg/L
c. Urinary iodine excretion rate <150 µg/L
d. Urinary iodine excretion rate <20 µg/L

38. Which of the following foods have low glycemic index?
a. Potatoes b. Whole grains c. Corn flakes d. White bread

39. The daily requirement of iodine (micrograms) for adults is:
a. 100 b. 150 c. 200 d. 250

40. Double edged sword is:
a. Chlorine b. Fluorine c. Selenium d. Lead

41. Prevention of Food Adulteration Act came into existence in:
a. 1948 b. 1950 c. 1952 d. 1954

42. Test for efficacy of pasteurization of milk is:
a. Methylene blue test b. Phosphatase test c. OTA test d. Nitric acid test

43. Pasteurization of milk is achieved by boiling at:
a. 65 degree for 30 minutes
b. 72 degree for 30 seconds
c. 100 degree for 20 seconds
d. 136 degree for 30 seconds

44. Anemia is common health problem among adolescent girls. What is the dose and regimen of iron and folic acid prophylaxis for adolescents according to national program?
a. 100 mg elemental iron + 500 mcg folic acid daily
b. 100 mg elemental iron + 500 mcg folic acid weekly
c. 60 mg elemental iron + 500 mcg folic acid daily
d. 60 mg elemental iron + 500 mcg folic acid weekly

45. Active principle for causing epidemic dropsy is:
a. Pyruvic acid
b. Beta Oxalyl Amino Alanine
c. Sanguinarine
d. Phenylpyruvic acid

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b. Urinary iodine excretion rate >100 µg/L
c. Urinary iodine excretion rate <150 µg/L
d. Urinary iodine excretion rate <20 µg/L

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b. Beta Oxalyl Amino Alanine
c. Sanguinarine
d. Phenylpyruvic acid

46. **Dental caries is due to deficiency of:** *(TRIU, 2023)*
a. Fluorine b. Zinc c. Lead d. Calcium

47. **Pectins, gums and mucilages:** *(MGUB, 2023, 2024)*
a. Soluble fibers b. Insoluble fibers
c. Noncarbohydrate fibers d. Resistant starch

48. **Lysine is not present in:** *(SSUHSA, 2023)*
a. Wheat b. Rice c. Bengal gram dal d. Red gram dal

49. **Which of the following is an essential fatty acid?** *(MGUB, 2023, 2024)*
a. Oleic acid b. Stearic acid c. Linoleic acid d. Palmitic acid

50. **Bitot's spot is visible in:** *(SSUHSA, 2023)*
a. Bulbar conjunctiva b. Palpebral conjunctiva c. Both d. None

51. **Which of the following will help to increase iron absorption from diet?** *(SSUHSA, 2023, 2024)*
a. Folic acid b. Pantothenic acid c. Ascorbic acid d. Nicotinic acid

52. **A 5-year-old child complains of poor vision ai night with no other refractive error. He is likely to be benefited by:** *(RUJH, 2023)*
a. Cod liver oil capsules b. Oral antibiotics
c. Eye drop containing antibiotics d. Suitable eyeglasses
e. Intraocular lens replacement

53. **All are true about growth monitoring in India, *except*:** *(WBUHS, 2023)*
a. AWWs are responsible for growth monitoring in AWC
b. ICDS growth chart is based on new WHO growth chart
c. ICDS growth chart is designed separately for boys and girl
d. Weight falls on and/or above (-) 3Z score indicates normal

54. **Severe wasting is:** *(RUJH, 2024)*
a. < 60% b. <70 % c. < 80% d. < 90%

55. **Severe acute malnutrition is defined by all except:** *(SSUHSA, 2023)*
a. MAC < 11.5 cm
b. Green color zone in plotting weight for age
c. Pedal edema
d. Very low weight for height

56. **Nutritional status of community is measured by all except:** *(GNSUB, 2023)*
a. Anemia detection in pregnancy
b. Child birth weight <2500 gm
c. Height and weight calculated in < 5 years age group
d. Mid-arm circumference in 0-1 year age group

57. **The mid upper arm circumference (cm) value for a child to have severe acute malnutrition is:** *(DBRAUA, 2024)*
a. < 11 b. 11.5 c. Between 11.5 and 12.5 d. > 12

58. **Which of the following indicator is used for growth monitoring at Anganwadi center:** *(AFUH, 2023)*
a. Height for age b. Weight for age
c. Height for weight d. Mid-arm circumference

[redacted]

59. In healthy normal growing children, the chest circumference should cross head circumference by
(GOAU 20

a. One year b. 3 years c. 5 years d. 7 years

60. Height of the under-five children is measured to assess their nutritional status. Which type of data height?
(WBUHS 20

a. Nominal b. Ordinal c. Interval d. Continuous

61. WHO growth chart is:
(AFUH 20

a. Used for monitoring growth and development of child
b. Has 3 lines
c. Highest line corresponds to 80th percentile and above
d. Lowest line corresponds to 50th percentile and above

62. BMI of a male whose weight is 89 kg and height is 172 cm:
(AFUH 20

a. 27 b. 30 c. 33 d. 36

63. BMI (body mass index) is defined as:
(RUJH 20

a. Weight (kg)/Height 2 (m)
b. Weight (kg)/Height 1.6 (cm)
c. Mid-upper arm circumference (cm)/ Head circumference (cm)
d. Mid-arm circumference (cm) between ages of 1–5 years

64. The normal range of BMI is:
(KIMS 20

a. 14.0-18.0 b. 18.5–24.9 c. 25.0–29.9 d. 35.0–39.9

65. The beneficiaries of Anganwadi are nursing mother, pregnant women, other women (15–45 years) children below 6 years and _____.
(KIMS 20

a. Adolescent girls b. Adolescent boys
c. Adult males d. Old age people

66. Which of the following is correct about reference Indian man?
(DBRAUA 20

a. Age between 21 and 19 years
b. Weight of 66 kgs
c. BMI 21.7 kg/m^2
d. Engaged in 8 hours of occupational work which involves moderate activity

67. Indicators for artificial feeding of newborn includes all except:
(DBRAUA 20

a. Failure of breast milk b. Birth weight more than 3 kg
c. Death of mother d. Prolonged illness of the mother

68. Global target on nutrition for young children is to reduce stunting by 2025 is:
(GNSUB 20

a. 20% b. 40% c. 60% d. 80%

69. Kishori Shakti Yojana (KSY) is:
(VBUJH 20

a. Employment of females under Maternity Benefit Scheme
b. Adolescent girls scheme under ICDS
c. Free and compulsory education for girl child
d. Child care home scheme for female juvenile delinquents

70. Guava is a rich source of:
(SSUHSA 20

a. Vitamin A b. Vitamin B c. Vitamin C d. Vitamin D

71. **Vitamin B and C contents of pulses can be increased by:** *(GOAU, 2023)*
a. Soaking in warm water
b. Germination
c. Fermentation
d. Boiling

72. **In which of the following diseases, extra dose of vitamin A not recommended:** *(GNSUB, 2023)*
a. Measles
b. Respiratory infection
c. Xerophthalmia
d. Protein energy malnutrition

73. **In a prudent diet, carbohydrates should contribute to -------- % of total energy.** *(ABKUB, 2023)*
a. > 70 b. 40–50 c. < 40 d. 60–70

74. **What is average protein requirement (gram) of reference Indian man?** *(ABKUB, 2023)*
a. 50 b. 60 c. 80 d. 100

75. **Acrodermatitis enteropathica is seen due to deficiency of:** *(ABKUB, 2023)*
a. Copper b. Zinc c. Iron d. Selenium

76. **Which cooking oil has highest amount of essential fatty acid?** *(AFUH, 2023)*
a. Groundnut oil b. Coconut oil c. Sunflower oil d. Caster oil

77. **Par boiling of paddy helps in retaining:** *(AKUB, 2024)*
a. Vitamin C b. Vitamin A c. Niacin d. Thiamine

78. **Cereals are deficient in _____ amino acid.** *(KIMS, 2023)*
a. Lysine b. Leucine c. Methionine d. Tryptophan

79. **Lysine is deficient in:** *(RUJH, 2024)*
a. Cereals b. Pulses c. Jowar d. Soyabean

80. **Pulse protein is deficient in which of the following essential amino acid?** *(WBUHS, 2023)*
a. Lysine b. Methionine c. Threonine d. Tryptophan

81. **Which of the following causes neurolathyrism?** *(WBUHS, 2023)*
a. Sanguinarine
b. Aflatoxin
c. Pyrrolizidine alkaloids
d. Beta oxalyl amino alanine

82. **Lathyrism is due to:** *(SSUHSA, 2023)*
a. Aflatoxin b. BOAA c. Pyruvic acid d. Sanguinarine

83. **A 42- years women was consuming khesari dal (*Lathyrus sativus*) for many years presented with weakness of lower limbs, nausea and fatigue. Over due course of time, she lost her ability to walk. What is likely toxin involved?** *(GOAU, 2023)*
a. Sanguinarine
b. Aflatoxin
c. Pyrrolizidine alkaloids
d. Beta-oxalyl amino alanine (BOAA)

84. **The toxin causing epidemic dropsy due to the contamination of:** *(WBUHS, 2024; DBRAUA, 2024)*
a. BOAA b. Sanguinarine c. Aflatoxin d. Pyrazolidine

85. **6 x 6 x 6 strategy targets which disease?** *(WBUHS, 2024)*
a. HIV b. Hypertension c. Anemia d. Diabetes

86. **Which of the food item is rich in iron content:** *(KIMS, 2023)*
a. Green leafy vegetables b. Milk c. Carrot d. Potato

87. **All of the following are sources of iron, except:** *(SSUHSA, 2024)*
a. Meat b. Liver c. Milk d. Spinach

88. The number of mega doses of vitamin A given to a child up to 5 years is: *(SSUHSA, 2024; DBRAUA, 2024)*

a. 5 b. 7 c. 9 d. 11

89. The earliest clinical sign of vitamin A deficiency is: *(TNUJ, 2024)*

a. Conjunctival xerosis b. Night blindness c. Bitot's spot d. Keratomalacia

Answers:

1.	c	**2.**	a	**3.**	c	**4.**	a	**5.**	b	**6.**	b	**7.**	d	**8.**	c	**9.**	d	**10.**	a
11.	a	**12.**	a	**13.**	c	**14.**	b	**15.**	b	**16.**	c	**17.**	c	**18.**	d	**19.**	d	**20.**	a
21.	a	**22.**	b	**23.**	b	**24.**	a	**25.**	b	**26.**	b	**27.**	b	**28.**	b	**29.**	c	**30.**	c
31.	c	**32.**	b	**33.**	a	**34.**	c	**35.**	c	**36.**	b	**37.**	a	**38.**	b	**39.**	b	**40.**	a
41.	d	**42.**	b	**43.**	a	**44.**	d	**45.**	c	**46.**	a	**47.**	b	**48.**	a	**49.**	c	**50.**	a
51.	c	**52.**	a	**53.**	d	**54.**	b	**55.**	b	**56.**	d	**57.**	b	**58.**	b	**59.**	a	**60.**	c
61.	b	**62.**	b	**63.**	a	**64.**	b	**65.**	a	**66.**	d	**67.**	b	**68.**	b	**69.**	b	**70.**	c
71.	b	**72.**	b	**73.**	d	**74.**	b	**75.**	b	**76.**	c	**77.**	d	**78.**	a	**79.**	a	**80.**	a
81.	d	**82.**	b	**83.**	d	**84.**	b	**85.**	c	**86.**	a	**87.**	d	**88.**	c	**89.**	a		

FILL IN THE BLANKS WITH APPROPRIATE WORD(S)

1. One of the important source of iron in diet is of _____ (cereals, green leafy vegetables, legumes, nuts, oilseeds, jaggery and dry fruits (date). *(BNMUB, 2015)*
2. _____ is the best and most complete of all foods. *(VKSUAB, 2023)*
3. The energy value of human milk is _____ *(SAMU, 2016)*
4. Sakir's tape is measuring tape which is used for measurement of _____ *(SAMU, 2016)*
5. A good anthropometric measurement in 1–5 year old children is _____ to assess nutritional status. *(VKSUAB, 2016)*
6. The calorie requirement of an Indian Reference man is _____ *(VKSUAB, 2016)*
7. The limiting amino acid in wheat _____ and in pulse it is _____ *(VKSUAB, 2018)*
8. Pulse proteins are poor in amino acid _____ *(KIMS, 2015)*
9. Term "vitamin" coined by the _____ *(VKSUAB, 2018)*
10. Iron and folic acid tablet for antenatal cases contain _____ mg of elemental iron and _____ microgram of folic acid. That for children from 6 months to 5 years contains _____ elemental iron and _____ folic acid. *(SAMU, 2015)*
11. Level of iodization in salt at production level is _____ ppm at consumer level is _____ ppm. *(VKSUAB, 2019; MU, 2024)*
12. Food fortification is used in the national program for _____ *(SAMU, 20...)*
13. Epidemic dropsy caused by a toxic alkaloid _____ *(VKSUAB, 2018; MU, 2024)*
14. Fungi Aspergillum flavus, which infest food grain, produce toxin named _____, which is hepatotoxic. *(KIMS, 2015)*
15. The product of digestibility coefficient and biological value, when divided by 100, gives _____ *(KIMS, 2015)*
16. Lathyrism in animal is referred as osteolathyrism and in human it is referred as _____ *(KIMS, 2015)*

Answers:

1. Vegetable origin
2. Milk
3. 70 (Seventy) kcal per 100 mL
4. Mid-upper Arm Circumference
5. MUAC
6. 2110 [ICMR 2020]
7. lysine, threonine; methionine, cysteine
8. Methionine and Cysteine
9. Casimir Funk, Polish Biochemist, 1912
10. 60 mg and 500 µgm: 20 mg and 100 µgm
11. 30;15
12. Iodine Deficiency Disorder (IDD)
13. Sanguinarine
14. Aflatoxins
15. Net Protein Utilization (NPU)
16. Neurolathyrism

SCHOOL HEALTH SERVICES

1. In school, desk should be _____ type. *(KIMS, 2014)*

Answers:

1. Minus

TRUE/FALSE

1. Protein quality is determined by NPU. *(SAMU, 2015)*
2. MAC is age independent indicator of malnutrition. *(SAMU, 2015)*
3. As per WHO, anemia in infants of 6 months of age is defined as Hb less than 110 mg/L. *(SAMU, 2015)*

Answers:

1. True
2. True
3. False

CHAPTER

6

Basic Statistics and its Applications and Research Methodology

CM6.2: Describe and discuss and demonstrate classification of statistical data.

Q1. What is data? Write types with suitable examples. *(BNMUB, 2018)*/**Data carry little meaning when considered alone** *(WBUHS, 2018)*/**Row data is not much useful unless it is in the form of information.** *(KIMS, 2024)*

Ans: Meaning of data: Collective recordings of observations either numerically or otherwise is called "data". It is information that has been translated into a form that is more convenient to move or process.

Information: When set of data undergone through statistical process like reducing and summarizing them adjusting them for variations, such as age and sex composition of the population, so that comparisons over time and place are possible.

Intelligence: It is the transformation of information through integration and processing with experience and perceptions based on social and political values produces intelligence.

Types:

Qualitative data:

- It is data obtained by enumeration or counting
- It can only be in full numbers and not in fractions
- Data collection methods are case study, key informant interview, in depth interview, focus group discussion.

Example: Sex, color, race, blood group, etc.

Attribute: The qualitative character of an event is called attribute, e.g., sex, religion, etc.

Quantitative data:

- It is obtained by measurements, in whole number and fractions
- Data collection methods are Interview, Questionnaire, Examination, Investigation, observation and documents.

Variable: The quantitative character of an event is called variable, e.g., age, weight and height, etc.

1. **Continuous data:**
   - Data can be uninterrupted infinite number of possible values in any interval
   - Fractions (decimals) are possible.
   - For example, height, weight, hemoglobin level, temperature, etc.
2. **Discrete data:**
   - Variable under observation having a fixed values in a given range, they are integer or whole number (no decimals), values are distinct and separated.
   - For example, number of family member, parity, number of households in the community, number of beds in hospitals, etc.

Data is the primary input required for formulating any national health policy hence accurate and reliable data is quintessential for community studies. So, when data alone it provides very little meaning but it is useful when it transforms into information.

Primary data: It is collected afresh for the first time and thus it is original in character, obtained directly from an individual either by survey or experiment.

Secondary data: It has been collected by somebody else and which have already been passed through the statistical process. The researcher would have to decide which data he/she would be using for his/her study and accordingly select the method/s of data collection.

Scales of measurement:

Nominal scale: It is least powerful among all measurement scales. In this scale, names, levels or tags are given to distinguish one measurement from another on the basis of certain qualities or attributes.

Examples: Color of eyes, place of residence, nationality, language spoken, etc.

Ordinal scale: It is also called ranking scale. It has the characteristics of the nominal scale with implicit order relationship among measurements. The qualitative and attributive data is usually measured on nominal or ordinal scale.

Examples: Goiter may be measured as no goiter, grade I and grade II, similarly nutritional status can be measured as normal, moderately underweight and severely underweight.

Interval scale: It is characterized by a numerical unit of measurement, such that the difference between any two measurements is explicitly known in terms of intervals between the two points.

Examples: Body temperature is usually measured on an interval scale and unit of measurement is degree Celsius (°C). Body weight and height are measured on interval scale.

Ratio scale: In which both the distance and ratio between two measurements are defined. It is both ratio and interval scales.

Examples: It is possible to specify the extent to which one measurement is larger than another (e.g., 80°C is warmer than 40°C, one meter is longer than 60 cm. However, a ratio scale has additional possibility of specifying the ratio between two measurements (e.g., one meter is twice as long as 50 cm).

CM6.2: Describe and discuss the principles and demonstrate the methods of collection of data.

Methods of data collection: Observations, Interviews, questionnaires, schedules, health examination, laboratory investigations, group discussions, surveys, case studies and case reports, etc.

Survey: It refers to the method of securing information concerning a phenomenon under study from all or selected number of respondents of the concerned universe. Investigator collects primary data particularly in surveys. Data can be collected by one or more methods, like: (a) Observation, (b) Through personal interview, (c) Through telephonic schedule, (d) By mailing of questionnaires, (e) through schedules, etc.

Sampling: When a large proportion of individuals or items or units have to be studied, we take a sample. It is important to ensure that the group of people or items included in the sample are representative of whole population to be studied, because the result obtained from that sample can be applied to whole population. **Sampling is a technique or procedure of drawing a sample from the universe.**

Collection of data through questionnaires: This method of data collection is very popular, especially in case of big enquiries. It is being adopted by private individuals, research workers, private and public organizations and by Governments also. A questionnaire is usually sent by post to the concerned persons with a request to answer the questions and return the questionnaire. A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms. The questionnaire is mailed to respondents who are expected to read and understand the meaning of questions and write down the answer in specified space in the questionnaire. The respondents have to answer the questions by their own.

The merits of the questionnaire are:

- It is low cost, even the universe is large and widely spread geographical areas.
- It is free from bias of the interviewers.
- Answers are prepared by respondent by their own words.

- Respondents who are not readily approachable, can also be reached conveniently.
- Respondents have got enough time to answer the questions.
- Large number of response can be assured and it is reliable.

The demerits of the questionnaire are:

- Low rate of return with duly filled questionnaires.
- The control over questionnaire may be lost once it is sent.
- It is useful only when the respondents are educated and cooperating.
- There is inbuilt inflexibility because of the difficulty of amending the approach once questionnaire have been dispatched.
- There is also the possibility of ambiguous replies or omission of replies altogether to certain questions.
- It is difficult to know whether willing respondents are truly representative.
- It is a slowest method.

Pilot study: Before using the questionnaire method, it is advisable to conduct a pilot study for testing of questionnaire. Pilot study is the rehearsal of main survey to be conducted by experts to find out any faults or weakness in the technique followed by improvement of questionnaire could be done.

Components of a questionnaire: Questionnaire is considered heart of the study or survey. The main aspect of questionnaire are:

- General form
- Question sequence
- Question formulation and warding

General form of questionnaire: It can be either structured or unstructured.

- **Structured questionnaires** are those questionnaire in which there are definite, concrete and predetermined questions. The questions are prepared with exactly same warding for all respondents and also standardized. The form of question may be either closed (i.e., of the type yes or no). It may be open type (i.e., inviting free response) but should be stated in advance and not constructed during questioning. Structured questionnaire may also have fixed alternative questions in which responses are limited. So, in highly structured questionnaire, the answers are specified and comments in respondents own wards and minimum in nature.
- In **unstructured questionnaire,** the interviewer is provided with a general guide on the type of information to be obtained, but the exact question formation is largely his own responsibility and response are noted down in the respondent's own words as far as possible. In some instance tape recorder could be used.

Question sequence: In order to have an effective and quality questions, the question sequence must be clear and smoothly moving, the relation of one question to another should be readily apparent to the respondent, with questions that are easiest to answer being put in the beginning. The first few questions are very important because they are likely to influence the attitude of the respondent and desired cooperation is sought. The opening question should arouse the interest of the respondents.

The following question should be avoided as opening questions like:

- The questions that put strain on the memory of the respondents
- Personal questions and question related to personal wealth.

Question formulation and wording: The questions should be constructed in such a way, forming a logical part of a well thought out tabulation plan. However, all questions should meet the following standards, viz.

- Should be easily understood
- Should be simple
- Should be concrete
- Should conform as much as possible to the respondent's way of thinking.

Concerning the form of questions, two principal forms are considered, viz., closed-ended and open-ended.

Closed or multiple choice questions (MCQs) have the advantages of easy handling, simple to answer, quick and relatively inexpensive to analysis. But the main drawbacks of fixed alternative questions is that of

"putting answers in people's mouths," i.e., they may force a statement of option on an issue about which the respondents does not in fact have any option.

In the other hand, **open-ended questions** are designed to permit a free response from the respondent rather than one limited to certain stated alternatives which are considered appropriate. Respondents can reply in their own words. It is more difficult to handle, raising problems of interpretation and also having comparability and interviewer bias.

Essentials of good questionnaire:

- It should be comparatively short and simple.
- Size of the questionnaire should be kept minimum.
- Questions should be prepared in logical sequence moving from easy to more difficult questions.
- Personal questions should be at the end.
- Technical terms should be avoided.
- Questions may be dichotomous (yes or no answers), multiple choice (alternative answers are listed or open ended).
- Open-ended questions are often difficult to analysis and hence should be avoided in a questionnaire.
- Some control questions in the questionnaire which indicate reliability of the respondent. The control questions are introduced to cross check whether the information is correct or not.
- Questions affecting the sentiments of respondent should be avoided.
- Adequate space for answer should be provided in questionnaire to help editing and tabulation.
- A brief directions with regards to filling up the questionnaire should be provided.
- The physical appearance of questionnaire should be attractive, the quality of paper along with the color must be good so that it attract the attention of participants.

Table 6.1: Differences between questionnaires and schedules.

Questionnaires	*Schedules*
It is generally sent through mail to informants to be answered as specified in a covering letter	It is filled up by researcher or enumerator
It is relatively cheap and economical since money have to spend in preparing questionnaire and in mailing the same to respondents, no field staff required	It is relatively more expensive. Money has to be spent to appoint enumerators and subsequent training. Money is also required for preparing schedules
Non-response is very high as many respondents do not respond and return it without answering	Non-response is very low in case of schedules because it is filled up by enumerators
It is not always clear as to who replies	Enumerator can identify respondents
It is likely to be very slow since many respondents do not fill up questionnaire timely despite several reminders	Information is collected and filled up by enumerators
Personal contact is generally not possible in case of questionnaire methods as questionnaire sent and return the same in post	Direct personal contact is established with respondents
This method can be used when respondents are literate and cooperative	This method, information can be gathered even he/she is illiterate
Representative and wider distribution of sample is possible	In this method it is difficult to send enumerators over a relatively wider area
When the respondents unable to understand the question properly, there is a risk of collecting incomplete and wrong information, enumerators can remove the difficulties	In case of schedules, information collected is generally complete and more accurate
Success of this method lies on quality of questionnaire itself	Success depends on honesty and competence of enumerators
Physical appearance and color must be attractive	Physical appearance is not much important as it is filled up by enumerators but not the respondents
Observation method is not possible in questionnaire methods	Observation method is used

CM6.2: Describe and discuss analysis, interpretation and presentation of statistical data.

Data analysis and interpretation:

- The term data and information are often used synonymously. Data mean collection of facts. Information is the outcome of data analysis and interpretation.
- Hence, data are abstract which when processed, provides information that are meaningful to the person receiving it. All reports which contain huge data must be analyzed to generate information for action. Data on diseases/health events collected by health system at various level must be analyzed locally first and also divided by population denominator to calculate rates. Rates are useful for comparing disease frequency at different times, places and persons for action.
- Voluminous data are collected both from rural and urban areas of primary health care facilities often lies dormant seldom used at local area for micro-planning. Data are collected from community, households and health facilities. Household survey data is gathered by ASHAs, AWWs and ANMs, they are having information of each and every household.
- Broadly, information is collected on total population, households/families, their demographic and socioeconomic status, drinking water and sanitation, eligible couples, pregnant and lactating mothers, immunization status of under six children as well as birth and deaths. Data on mortality, morbidity, injury and disability is seldom compiled and analyzed at local levels for micro-planning.
- Data analysis means data reduction or summarization. It means reduction of voluminous quantity of data in the form of summary. As a human being it is not possible to handle huge information at the same time. Data can be summarized by tabulation, charts and diagrams. Also summarized as rate, ratio and proportion, measures of central tendency (mean, median, mode) or by dispersion.

Q2. Presentation of statistical data. *(SSUHSA, 2021; PBDSUHSH, 2018)*
Methods of presentation of statistical data. *(BNMUB, 2010; DU, 2016)*

Ans: Quantitative data are those which have numerical value. Example is frequency distribution. Qualitative data are those which has no numerical value, but which can be measured, like Hindu/Muslim, died/cured, etc. It can be presented in the following ways:

Tabulation: They are devices for presenting data simply from mass of statistical data. Tables are of different types.

Frequency distribution table:

Table 6.2: Frequency distribution table showing patients attended in different OPDs in hospital.

Name of the OPD	*Frequency*
Medicine	700
Surgery	820
Gynecology and obstetrics	940
Pediatrics	540
Others	1,020
Total	4,020

Contingency table: This type of table helps to measure the association between two variables.

Table 6.3: Incidence of lung cancer according to smoking status.

	Lung cancer—present	*Lung cancer—absent*	*Total*
Smokers	70	6,930	7,000
Non-smokers	3	2,997	3,000
Total	73	9,927	10,000

Charts and diagrams: They are very useful method for presenting qualitative data. Following types of charts and diagrams are used.

Bar diagram. *(WBUHS, 2007; RGUHS, 2009)*

- A bar diagram consists of a group of equidistant rectangular bars each of which represent one category or class of qualitative data
- The heights of the bars are proportional to the frequency of each category.
- The bars should be separated by spaces equal to the width of the bars for neat and clean presentation.
- A suitable scale must be chosen to present the height of the bars.
- Frequency is plotted along the other side.
- **Y axis:** Vertical type
- **X axis:** Horizontal type
- If the lowest frequency of any category is *far above* zero, the lowest frequency is plotted showing a break between zero and the point depicting the lowest frequency.

Bar diagram are of following types:

A. **Simple bar diagram:** Each bar represents frequency of a single category with a distinct gap from another bar **(Fig. 6.1)**.

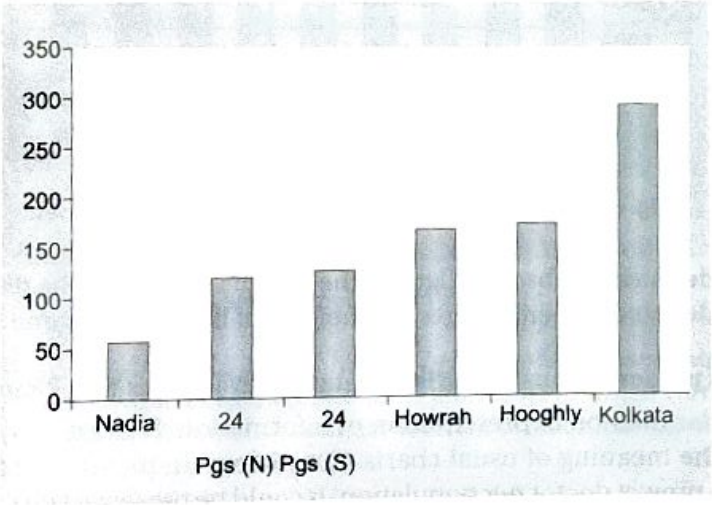


Fig. 6.1: Simple bar diagram showing distribution of HIV cases in Kolkata and five districts of West Bengal.

B. **Multiple/compound bar diagram:** These are used to show the comparison of two or more sets of related statistical data **(Fig. 6.2)**.

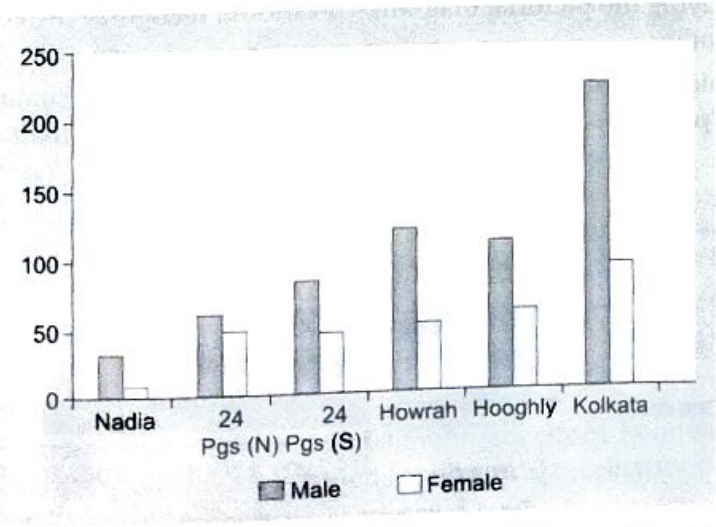


Fig. 6.2: Multiple bar diagram showing distribution of TB cases in Kolkata and five districts of West Bengal.

Component bar diagram:

These are used to:

- Compare relative size of different components.
- Compare relation of different components with the whole.

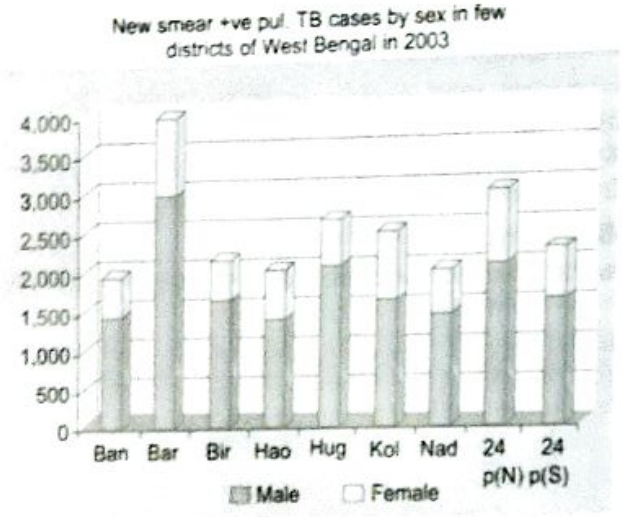


Fig. 6.3: Distribution of pulmonary TB cases according to sex.

- If frequencies are denoted by absolute figures, the heights of bars will be different.
- If frequencies are denoted by percentages, the heights of bars will be same **(Fig. 6.3)**.

Methods of pictorial presentations of statistical data. *(BNMUB, 2006)*; **Pictogram** *(KIMS, 2019)*

Pictograms are popular method in presentation of information. It is specially used for those persons who cannot understand the meaning of usual charts. For pictogram pictures or symbols are used. Symbol of doctor can be used to project doctor per population. It could be presented district wise, state wise or country wise. It is one form of bar chart. Pictorial diagram is the simplest of all diagrams. The pictorial diagram is a picture or sketch of the components of a specific system. This simplified diagram identifies components, even if you are not familiar with their appearance. This type of diagram does not show physical locations of components or the manner. It does, however, show you the sequence in which the components are connected. After studying the pictorial diagram, you should recognize the components and how they are connected to one another.

It is a diagram depicting small pictures used as symbols to present the data a picture of a doctor and few people represent the population for physician in presenting doctor-population ratio **(Fig. 6.4)**.

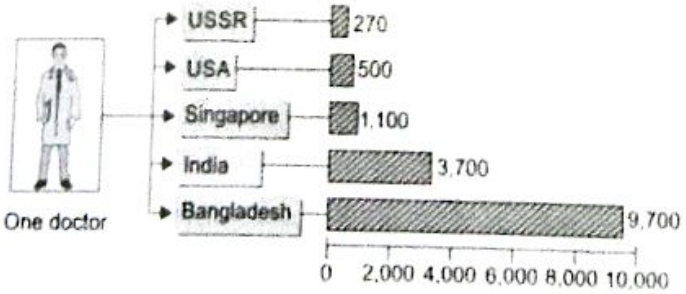


Fig. 6.4: Population per physician.

Pie diagram/Chart. *(RGUHS, 2001; TDMGRMU, 2015; ABKUB, 2007; RUJH, 2023; VBUJH, 2023)*

- It is a circle whose area is divided into different segments by drawing straight lines from center to circumference expressing proportional components of the attributes **(Fig. 6.5)**.
- Size of one segment, thus, is compared with that of other segments as well as the whole circle.
- Areas of sectors are proportional to frequencies.
- Angle (degree) of a sector at center of circle is calculated by 100% = 360°, i.e., (Class frequencies/Total frequencies) X 360 or Relative frequency X 3.6.

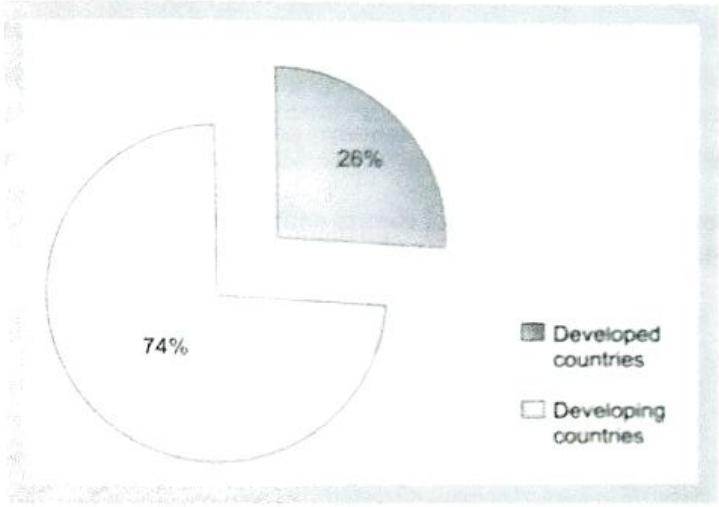


Fig. 6.5: World population at percent.

Histogram. *(RGUHS, 2012; TDMGRMU, 2010; SMU, 2014)*/**Graphic presentation of data.** *(SSUHSA, 2008)*
Histogram is a graphic representation of frequency distribution table in which vertical axis represents frequency and horizontal axis represents class interval. It consists of series of block. Histogram of frequency distribution of blood pressure in female aged 45–65 years **(Fig. 6.6)**.

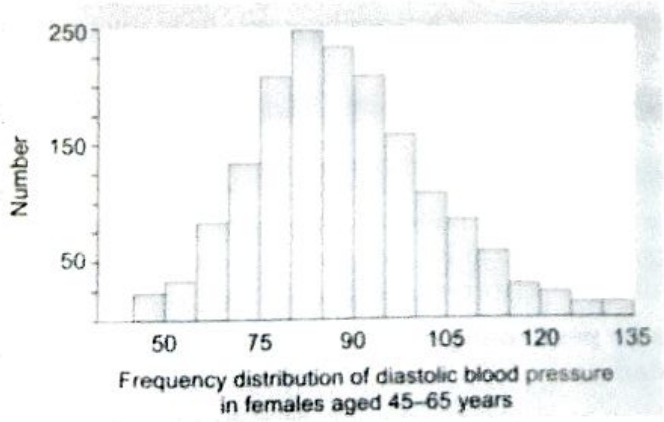
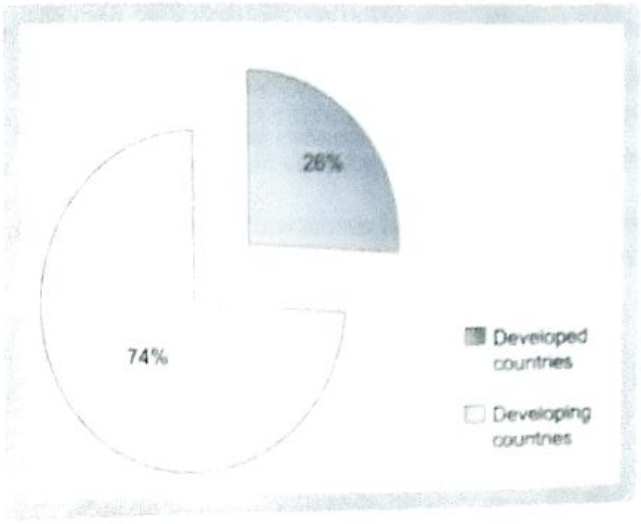


Fig. 6.6: Histogram.

Frequency polygon: *(BUMP, 2010)*
A frequency distribution may also be represented diagrammatically by frequency polygon. It is obtained by joining the mid-points of histogram blocks. Frequency polygon of the distribution of systolic blood pressure in the community **(Fig. 6.7)**.

Pie diagram/Chart. *(RGUHS, 2001; TDMGRMU, 2015; ABKUB, 2007; RUJH, 2023; VBUJH, 2023)*

- It is a circle whose area is divided into different segments by drawing straight lines from center to circumference expressing proportional components of the attributes **(Fig. 6.5)**.
- Size of one segment, thus, is compared with that of other segments as well as the whole circle.
- Areas of sectors are proportional to frequencies.
- Angle (degree) of a sector at center of circle is calculated by 100% = 360°, i.e., (Class frequencies/Total frequencies) X 360 or Relative frequency X 3.6.



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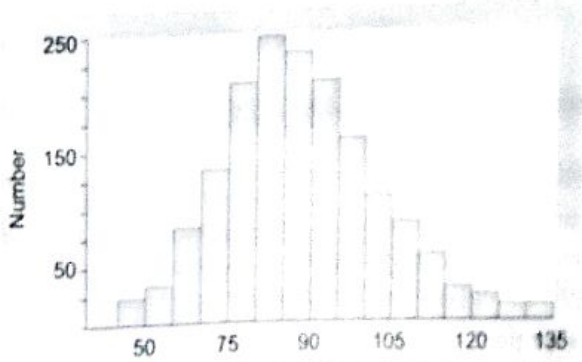


Frequency distribution of diastolic blood pressure in females aged 45–65 years

Frequen... *(BUMP, 2010)*
A fre... polygon. It is obtained by
... blood pressure

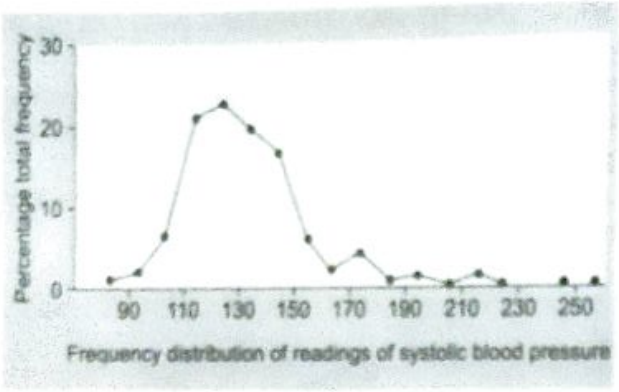


Fig. 6.7: Frequency polygon

Line diagram: *(ABKUB, 20*

Line diagrams are used to show the **trend of events with passage of time. Line diagram** showing the trend of malaria case recorded throughout **the world (excluding the African region)** during 1972–1978 (Fig. 6.8)

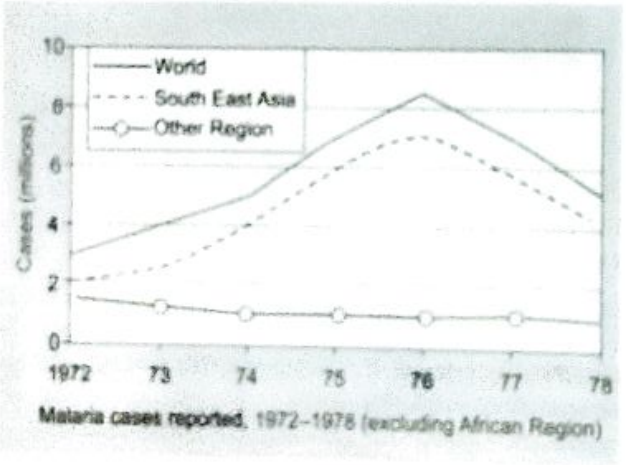


Fig. 6.8: Line diagram

CM6.3: Describe, discuss and demonstrate the application of elementary statistical methods.

CM6.4: Describe measures of central tendency.

Elementary statistical methods are **the collection, analysis, presentation, and interpretation of data, and probability**. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Use of appropriate technology is strongly recommended.

The following methods for performing statistical analysis:

- Mean, Median and Mode
- Mean deviation
- Standard deviation
- Correlation and regression

Q3. Measurement of central tendency. *(WBUHS, 2023, 2024; MGUB, 2022, 2024; ABKUB, 2022, 2023; BNMUB, 2016, YSRUHSAP, 2016; PBDSUHSH, 2017; RGUHS, 2011, 2015, SAMU, 2018; TRIU, 2016, 2020, 2023;TDMGRMU, 2013; SSUHSA, 2012, 2016, 2022; SMU, 2012, 2014; KTMS, 2023; VNSGUS, 2023; DBRAUA, 2024)*

Ans: We observe that every statistical datum has a tendency to cluster around a certain value, possibly at the center of observations. This tendency of statistical data is called central tendency.

A numerical value which represents (approximately) the central statistical data is called a measure of central tendency of that data. The numerical value which represents the central statistical data is neither the lowest nor the highest value in the data, rather it lies in between the two extreme values of the data.

The different ways of measuring central tendency of a statistical data are Mean, Median and Mode.

Statistical average *(WBUHS, 2012; BNMUB, 2013; ABKUB, 2007; SAMU, 2013; KIMS, 2013; RUJH, 2011)*/**For small sample, median is a better measure of central tendency. Why?** *(WBUHS, 2014)*/**Median is a better measure of central tendency in a widely dispersed data set.** *(WBUHS, 2016; 2023, 2024; VNSGUS, 2023)*

The word "average" implies a value in the distribution, around which other values are distributed. There are several kinds of averages of which are commonly used, mean, median and mode.

Mean: Mean provides single value that could describe the characteristics of the entire data.

- It is the most representative value.
- This is arithmetic mean or average.
- Mean birth weight; mean Diastolic Blood Pressure are examples of mean.

Merits:

- Easy to understand and compute.
- Based on the value of every item in the series.

Limitations:

- Mean is affected by extreme values.
- Not useful for the study of qualities like intelligence, honesty and character.

Calculation of mean from the observation:

The weights of 10 school boys are: 42, 44, 46, 43, 62, 54, 50, 41, 38, 50. Calculation of mean from the above data.

$$\text{Mean (Average)} = \frac{\text{Sum of all observation}}{\text{Number of observation}}$$

$$\text{Symbolically, Mean } (\bar{x}) = \frac{\Sigma x}{n}$$

(Where, x = Observation; Σx = Sum of all observations and n = Number of observations)

$$\text{So here, Mean } (\bar{x}) = \frac{42 + 44 + 46 + 43 + 62 + 54 + 50 + 41 + 38 + 50}{10} = 470/10 = 47 \text{ kg}$$

Median: For calculation of median, data is arranged in ascending or descending order. The middle value is median. By this process, 50% of the population has a value smaller than and 50% of the sample has a value larger than median. Thus, central data of any frequency distribution, when orderly arranged, odd number form median but in case of even observation, the median is calculated arbitrarily as the average of the two middle values.

Merits and Limitations of Median

Merits:

- Extreme value do not affect median significantly
- Unique and easy to calculate
- Useful in markedly skewed distributions
- More appropriate when the measure is duration (survival), age, etc.

Limitations:

- It is necessary to arrange the data
- Not capable of algebraic treatment

- It is a positional average and value is not determined by each and every observation
- It is erratic if the number of items is very small

So, for small samples, median is a better measure of central tendency because it is easy to calculate and interpret and subsequent analysis and also it is not affected by outliers.

Again, we can conclude, median is a better measure of central tendency in a widely dispersed data set.

Let us consider an example:

Set I: Observations are 9, 7, 4, 5, 3, 2, 14, 5 and 6, an odd no. of distribution.
After arrangement in ascending order the observation will be 2, 3, 4, 5, 5, 6, 7, 9, 14. In case of odd no. of distribution.

$$\text{Median} = \frac{n+1}{2} = \frac{9+1}{2} = 5, \text{Median will be 5th value}$$

Set II: Observations are 9, 7, 4, 5, 3, 2, 14, 5, 6 and 9.

After arrangement the observation are **2, 3, 4, 5, 5, 6, 7, 9, 9 and 14, an even no. of observation.**

In case of even no. of distribution,

$$\text{Median will be} = \frac{(n/2)\text{th} + (n/2+1)\text{th}}{2} \text{ Observation}$$

$$\text{Median} = \frac{(10/2)\text{th} + (10/2+1)\text{th}}{2} \text{ Observation}$$

$$\text{Median} = \frac{5\text{th} + 6\text{th}}{2} \text{ Observation}$$

$$\text{Median} = \frac{5+6}{2} = 5.5$$

Median will be average of 5th and 6th observations

Mode:

- Mode is frequently occurring observation of a data set.
- The weights of 10 school boys are 42, 44, 46, 43, 62, 54, 50, 41, 38 and 50.
- As the value '50' occurred twice (most frequent observation in the given data set); **so, mode is 50 kg**

Advantages:

- It is easy to calculate and understand.
- It is least influenced by extreme of values.

Disadvantages:

- It is often not clearly defined.
- It may not exist in a small group of values.

CM6.4: Describe and discuss measures of dispersion.

Q4. Measures of Dispersion. *(WBUHS, 2012, 2016, 2021; AKUB, 2022; MGUB, 2022; ABKUB, 2015, 2018; SAMU, 2011, 2015, 2022; KIMS, 2017, 2022; NU, 2018)*

Ans: There are several measures of dispersion of which the following are widely used. Range, mean deviation, standard deviation and variance are frequently used.

Range: It is defined as the difference between the smallest and the largest observations in a given set of data.

Formula:

Range = Largest value - Smallest value.

Find out the range of the given distribution: 1, 3, 5, 9 and 11.

Range is 11 - 1 = 10.

Advantage: It is simple to calculate, easy to understand, extreme values are dependent on sample size.

Disadvantage: Influenced by extreme values; uses only two data points.

Interquartile range: Here the observations are divided into four quarters. The quartile 1 (Q1) indicates that 25% of the observations fall below it and 75% are above it and quartile 3 (Q3) indicates that 25% of values are above it and 75% are below it. The interval between Q1 and Q3 covers middle 50% of values of observations in group. Unlike the range, the value given by interquartile range is unaffected by the occurrence of rare/extreme values and thus it makes a good measure of dispersion.

(SSUHSA, 2006)

Q14. Mean deviation.

Ans: Mean deviation = Average deviations of observations from mean value.

Symbolically, Mean Deviation (MD) = $\frac{\Sigma|x-\bar{x}|}{n}$

Where, x = Observation; $\bar{x}$ = Mean of all observation; Σx = Sum of all observation; n = Number of observations and modulus (| |) and this sign is used to ignore (+) or (–) sign.

From the given observation: Hb% (g/dL) of 10 pregnant women was found to be 7, 10, 12, 9, 10, 14, 12, 13, 12 and 11.

Hb% in g/dL (x)	Mean ($\bar{x}$) (g/dL)	$(x-\bar{x})$	$\lvert x-\bar{x}\rvert$
7	$\bar{x}=\frac{\Sigma x}{n}$	–4	4
10		–1	1
12	$=\frac{110}{10}=11$	1	1
9		–2	2
10		–1	1
14		3	3
12		1	1
13		2	2
12		1	1
11		0	0
$n=10$			$\Sigma\lvert x-\bar{x}\rvert = 16$

So here MD = $\frac{\Sigma|x-\bar{x}|}{n} = (16/10) = 1.6$

Q15. Standard deviation. *(BNMUB, 2011, 2015, 2017; RGUHS, 2011; TDMGRMU, 2009; KIMS, 2015; BUMP, 2010; NU, 2015)*

Ans: Hb% (g/dL) of 10 pregnant women was found to be 7, 10, 12, 9, 10, 14, 12, 13, 12 and 11.
Standard deviation (SD) = Square root of square of average deviations of observations from mean value. In simple terms it is **'root-means-square-deviation'.**

$$SD\ (\sigma) = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

Where, $\bar{x}$ = Mean of all observation; Σx = Sum of all observations;
n = Number of observation. As, here $n < 30$, the denominator will be $(n-1)$.

Hb% in g/dL (x)	Mean ($\bar{x}$) (g/dL)	$(x-\bar{x})$	$(x-\bar{x})^2$
7	$\bar{x} = \frac{\Sigma x}{n}$	−4	16
10		−1	1
12	$= \frac{110}{10} = 11$	1	1
9		−2	4
10		−1	1
14		3	9
12		1	1
13		2	4
12		1	1
11		0	0
$n = 10$			So, $\Sigma(x-\bar{x})^2 = 38$

So here SD, will be = $\sqrt{\frac{\sum(x-\bar{x})^2}{(n-1)}} = \sqrt{\frac{38}{(10-1)}} = \sqrt{\frac{38}{9}} = \sqrt{4.22} = 2.05$

Variance: Sum of squared deviations, taken from the mean, divided by the number of observations-n (or $n-1$ for an unbiased sample variance), expressed as square of unit of the original observations.

Coefficient of variation (CV): The coefficient of variation is the standard deviation expressed as a percentage of arithmetic mean (AM).

$$CV = \frac{SD}{AM} \times 100$$

$$CV = \frac{2.05}{11} \times 100 = 18.64$$

CM6.4: Describe and discuss frequency distribution.

Frequency distribution: Frequency means number of health events such as number of cases of a disease in population or number of observations. Frequency refers not only the number of health events such as number of health events such as number of cases of diarrhea or hypertension in a population, but also to the relationship of that number to the size of the population. With a large number of observations, it is very difficult to gather desired information at a glance. Through frequency distribution, the variables can be summarized in the table.

A frequency distribution can also be represented graphically by a bar chart or histogram, etc.

Table 6.4: Frequency distribution of sex ratio of India.

Gender	Frequency (million)	Population (percent)	Male-female ratio
Male	623	51.5	1,000
Female	587	48.5	943
Total	1,210	100.00	

Interpretation: Sex ratio of 943 for females per 1,000 males during Census 2011 in India.

Q5. What is contingency table? *(RGUHS, 2009)*

Ans: A contingency table is a statistical table that shows the observed frequencies of data elements classified according to two variables, with the rows indicating one variable and columns indicating another variable.

The data displayed in the column or row is arranged to facilitate the discovery of any relationship that may exist between sets of data.

The term was first used by Karl Pearson in 1904.

Features:

- Each location in a table is called cell and corresponding frequency is called cell frequency.
- Simplest form of contingency table displays two sets of data in rows and column respectively which constitutes a fourfold or 2 × 2 table.
- More complex type of contingency table can be constructed with a further sub-divided data in columns and rows.

Example: Dietary habits of a random sample of 100 individuals was sub-divided by two major religions as shown in 2 × 2 contingency table as follows:

Table 6.5: Dietary habits of Hindu and Muslim population.

	Vegetarian	*Non-vegetarian*	*Total*
Hindu	43	9	52
Muslim	4	44	48
Total	47	53	100

Application: Contingency tables are used to record and analyze the relationship between two or more variables.

The frequency distributions have three properties:

1. Central location or central tendency (1st property)
2. Spread (2nd property)
3. Shape (3rd property)

Q6a. Normal curve/Gaussian curve. *(WBUHS, 2013; AKUB, 2022; BNMUB, 2012, 2018; ABKUB, 2018, 2019, 2022, 2023; PBDSUHSH, 2018; YSRUHSAP, 2021; RGUHS, 2015; SAMU, 2004; TDMGRMU, 2011; KIMS, 2015, 2021; BUMP, 2013; DU, 2013; SMU, 2014; NU, 2015, 2016; RUJH, 2009; SDVPG, 2023)*

Ans: It is an important curve in descriptive and inferential statistics. It is a continuous symmetrical curve where both the tails extending to infinity. It is also bell shaped. Arithmetic mean, median and mode are identical. Symbolically, mean is denoted by μ and standard deviation (SD) as α. Mean determines the location of the center of the curve. The spread or variation around the mean is represented by α. Larger is the SD, greater is the spread of values. Between $\mu \pm 1\alpha$ area is about 68 percent, between $\mu \pm 2\alpha$ area is about 95 percent and between $\mu \pm 3\alpha$ area is about 99 percent of the total area of the curve **(Fig. 6.9)**.

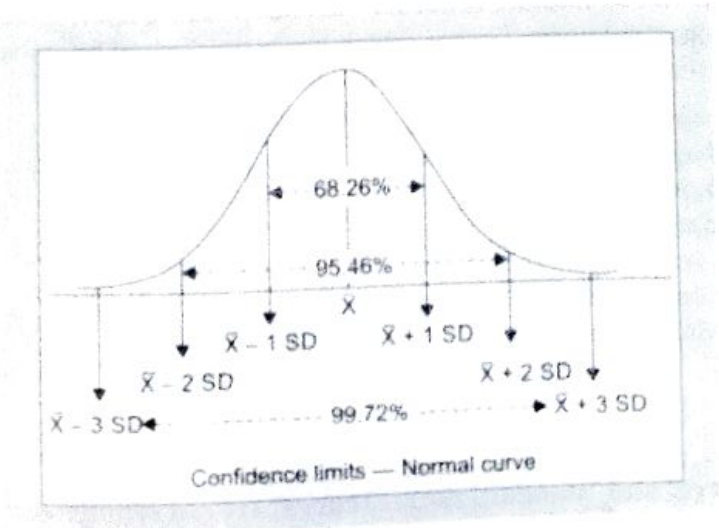


Fig. 6.9: Normal curve.

Q6b. Uses of normal curve. *(ABKUB, 2011)*

Ans: Normal curve is making probability statement about the number of individuals in any range of measurements. Common/Uncommon measurements. We can take the idea of its use in practice from the picture normal curve given below **(Fig. 6.10).**

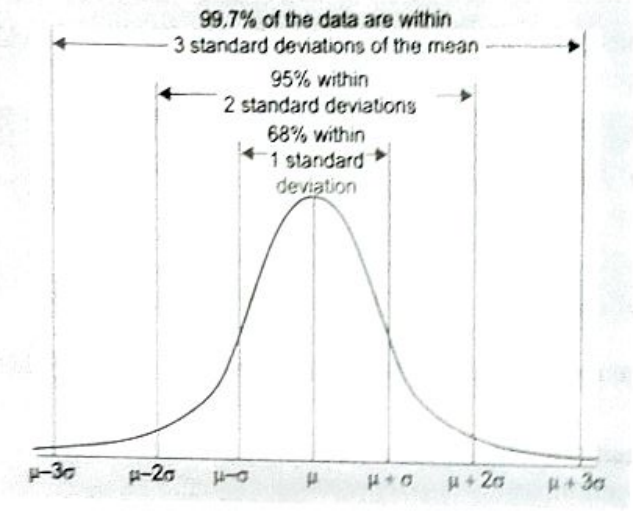


Fig. 6.10: Normal curve.

For the normal distribution, the values less than one standard deviation away from the mean account for 68.27% of the set; while two standard deviations from the mean account for 95.45%; and three standard deviations account for 99.73%. **This fact is known as the 68-95-99.7 (empirical) rule, or the 3-sigma rule.**

Q6c. Standard normal curve. *(WBUHS, 2010, 2018; VKSUAB, 2019; RGUHS, 2012, 2013; SAMU, 2011; TRIU, 2015; TDMGRMU, 2014; RUJH, 2011; KIMS, 2019; AKUB, 2024; ABKUB, 2022)*

Ans: Normal curve is an important concept in statistical theory. Suppose we collect the hemoglobin values of a very large number of people and make a frequency distribution with narrow class intervals, we are likely to get a smooth symmetrical curve. Such a curve is called normal distribution or normal curve. The shape of the curve depends upon mean and standard deviation which in turn will depend upon the number and nature of observations.

Although there is an infinite number of normal curve depending upon the mean and standard deviation, there is only one standardized normal curve, which has been devised by statisticians to estimate easily the area under the normal curve, between any two ordinates.

Important features of standard normal curve are as follows:

- It is a smooth bell shaped, perfectly symmetrical curve, based on infinitely large number of observations.
- The total area of the curve is 1.
- Mean is 0 and standard deviation is 1.
- The mean, median, mode all coincide.
- Unit deviate is usually denoted by Z.

Z is given by the following formula:

$$Z = \frac{(x - \bar{x})}{\Sigma}$$

Q6d. The term "normal curve" and "standard normal curve" are not synonymous. *(WBUHS, 2019)*

Ans: Answer from Q6.

Properties of frequency distribution:

A. **Central location or central tendency is the 1st property of frequency distribution**

B. **Spread: 2nd property** of frequency distribution is spread, also called variation or dispersion. Degree of spread or scattering of observation/values around the central value is called dispersion. Common measures of dispersion are range, semi-quartile range and standard deviation. **Fig. 6.11** illustrates two theoretical frequency distribution that have same central location but different amount of spread.

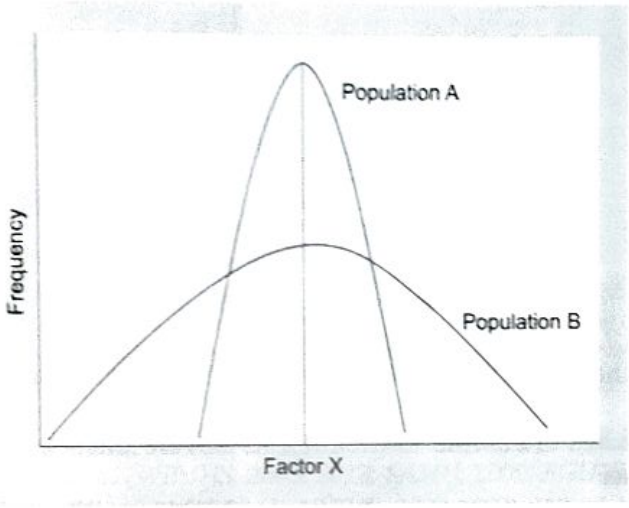


Fig. 6.11: Spread.

C. **Shape: 3rd property** of frequency distribution is its shape. Some frequency distributions are asymmetrical or more commonly referred to as skewed.

Skewness: A distribution is said to be **positively skewed** when the tail on the right side of the histogram is **shorter** than the left side. Most of the values tend to cluster towards the left side of the x-axis (i.e., the smaller values) with increasingly fewer values at the right side of the x-axis (i.e., larger values) **(Fig. 6.12)**.

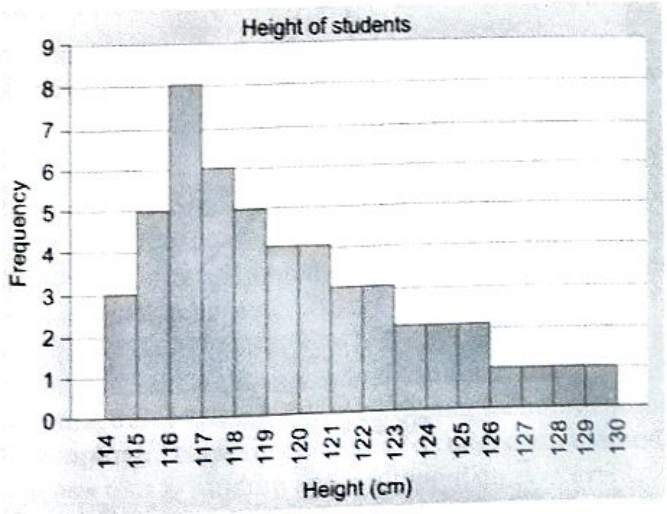


Fig. 6.12: Positive skewed.

A distribution is said to be **negatively skewed** when the tail on the left side of the histogram is shorter than the right side. Most of the values tend to cluster towards the right side of the x-axis (i.e., the larger values) with increasingly less values on the left side of the x-axis (i.e., smaller values) **(Fig. 6.13)**.

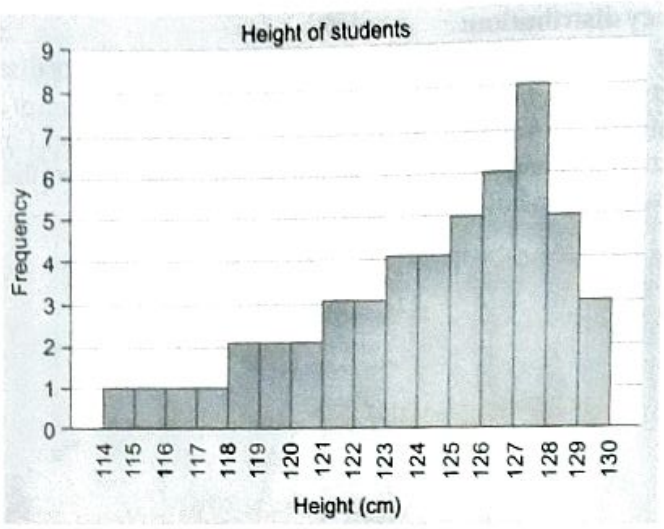


Fig. 6.13: Negatively skewed.

Kurtosis: It relates to the peaked ness or flatness of frequency distribution. The property of bulging is called kurtosis **(Fig. 6.14).**

a. **Leptokurtic:** Compared to a normal distribution, its tails are longer and fatter and often its central peak is higher and sharper.
b. **Mesokurtic:** It is a curve having a normal pear or normal curve. There is equal distribution around the center value (mean). In such cases, mean, median and mode are equal.
c. **Platykurtic:** Compared to a normal distribution, its tails are shorter and thinner and often its central peak is lower and broader.

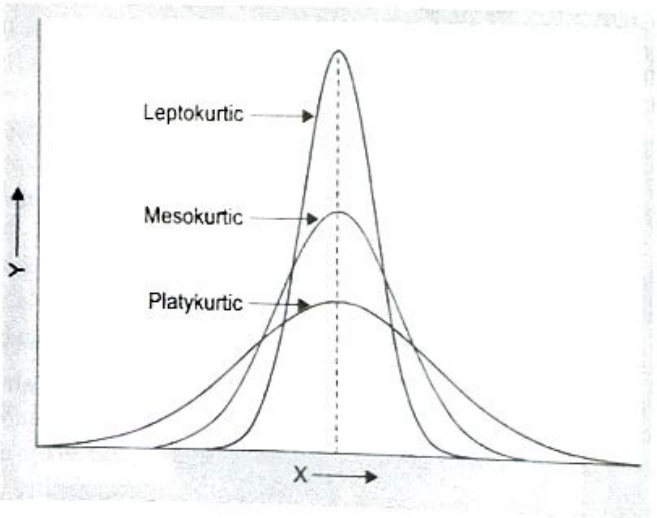


Fig. 6.14: Kurtosis.

CM6.4: Enumerate, discuss and demonstrate Common sampling techniques.

Q7. Sampling technique. *(TRIU, 2020, 2023; ABKUB, 2019, 2023; GOAU, 2021)*

It can be divided into the following manners like probability and non-probability sampling.

Probability sampling (Random sampling) and its type: *(VBUJH, 2022; MGUB, 2024; VKSUAB, 2021)*

- The individuals or cases are chosen at random from population, so it is random sampling.

- Each member has equal and definite probability or chance of being included in the sample, hence known as probability.
- Leaving no scope for arbitrary choice by any person.

Nonprobability sampling (nonrandom sampling): *(MU, 2023)*

- Selection of sample is done by the researcher on his own choice.
- It does not follow the law of probability.
- Chance of selection bias is high.

Table 6.6: Difference in probability sampling vs nonprobability sampling.

Probability sampling (random sampling)	*Nonprobability sampling (nonrandom sampling)*
Random selection	Nonrandom selection
Unbiased	Biased
All units have equal chance of being selected	All units do not have equal chance of being selected
Examples: Simple random sampling, systematic random sampling, stratified random sampling, multistage sampling, multiphase sampling, cluster sampling and lot quality assurance sampling, etc.	**Examples:** Judgmental sampling or purposive sampling, convenience sampling, snowball sampling, volunteer sampling, etc.

Q8. What is sampling? What are the different types/methods of sampling? Describe them briefly with their advantage and limitations. *(WBUHS, 2009, 2013; SAMU, 2009; RGUHS, 2003; SSUHSA, 2013, 2015, 2022; TRIU, 2013, 2016, 2021; TDMGRMU, 2011; ABKUB, 2008, 2018, 2023; KIMS, 2014, 2019; BUMP, 2013; DU, 2012; SMU, 2009; RUJH, 2010, 2012; MGUB, 2023, AKUB, 2024; SDVPG, 2023)*/**Systematic Random Sampling** *(BNMUB, 2014; SMU, 2015; SAMU, 2016)*/**Simple random sampling** *(WBUHS, 2019; NU, 2014)*/ **Stratified sampling** *(WBUHS, 2017)*

Ans: **Sampling:** When a large proportion of individuals or items or units have to be studied, we take a sample. It is important to ensure that the group of people or items included in the sample are representative of whole population to be studied, because the result obtained from that sample can be applied to whole population. **Sampling is a technique or procedure of drawing a sample from the universe.**

Advantages of sampling:

- Sampling reduces demands on resources such as money, manpower, material.
- Results are obtained very quickly.
- Sampling leads to better accuracy, if a representative sample is taken.

Types of sampling:

A. **Simple random sampling:** It is the most acceptable and easy to understand method of sampling. In simple random sampling, each study unit has an equal chance of being included in the sample. In this method, we list and number each unit, mix up them thoroughly and then select one unit at a time from the box until the required sample size is achieved.
Advantages: This method is fairly applicable when population is small and homogenous and readily available such as village, a household, an individual or a community.
Limitation: If the sampling frame is large, this method may be impracticable.

B. **Systematic random sampling:** This is very simple and convenient method. In this, a systematic sample is formed by selecting one unit at random and additional units at evenly spaced intervals. The second requirement is to calculate the interval called sampling interval, which is calculated by

$$K = N/n$$

Where N = Total size of population, n = Sample size
Advantages: This method is applied when population is large, scattered. No pre-numbering is necessary as in random sampling.
Limitation: It cannot be applied on small sample.

C. **Stratified random sampling:** *(BNMU, 2020)*

When the population is not homogenous, this technique is used. The population is first divided into groups or strata according to characteristics or interest. For example, in a village, it is observed that there are two strata of population one stratum comprising over landowners and well-to-do people and second stratum is of landless or weaker sections of the community, if we wish to study the undernutrition in the village, we will draw the sample from two different strata.

Advantages: Used when population is heterogeneous, can estimate characteristics of each strata separately.

Limitations: It cannot be used in homogenous population.

D. **Multistage sampling:** The sampling procedure carried out in several stages using random sampling techniques. It is useful when population of entire district is to be studied. First random number of districts is to be chosen from states, then random numbers of talukas are chosen followed by particular villages and houses are chosen.

Advantages: This method introduces flexibility in sampling, feature lacking in other techniques. It enables the use of existing divisions and subdivisions thus save extra labor involved in independent enumeration.

Limitations: Sampling error is usually increased. Sampling units will be of unequal size at various stage resulting analytical difficulties.

E. **Cluster sampling:** Sampling unit is cluster but not the individuals. A sample of clusters proportionate to their size is randomly drawn.

Advantages: Suitable for evaluation of immunization coverage and related works.

Limitations: Individual information cannot be obtained.

30 Cluster sampling: *(DU, 2011; TRIU, 2021)*

For an evaluation of immunization coverage and also coverage with other services, data need to be systematically collected on the number of children and pregnant women.

Immunized by vaccine or selected services could be done by age. For evaluation of above said services the method used is cluster sampling technique popularly known as 30 cluster sampling. **A cluster is a randomly selected group.** Each group should have at least 7 children in the age group of 12–23 months, minimum age should not be less than one year. For mothers, a group of 7 mothers, each of whom delivered a baby in the last one year, forms a cluster.

The cluster sampling technique allows a small number of target population to be sampled and provides data which are statistically valid.

A survey containing 30 clusters of 7 children will provide information on proportion of children immunized completely. Statistically, it will meet the following standards of reliability:

- The data obtained from the survey will have a level of accuracy of plus or minus 10%. For example if a survey shows immunization coverage of 70 percent in the sample but the actual coverage in the target population will be between 60 and 80 percent.
- 19 out of 20 times the result of the survey will be within the stated level of accuracy. The level of confidence is 95 percent, which means there is a 95 percent probability that the survey results will fall within the range mentioned above (plus or minus 10 percent of the coverage in the target population)
- The survey data will reflect coverage of a period of one year prior to the date of survey.
- The results will reflect coverage in area as whole. The comparisons between clusters are not valid.

Data will be valid only when 30 clusters are selected randomly. The randomly selected cluster or group is one which is chosen by chance.

The following steps should be followed in 30 cluster sampling: For example, total cumulative population of the area (where 30 cluster sampling) is about 50,000.

Step 1: Sampling interval has to be calculated by the formula:

Total cumulative population ÷ 30 clusters = 1666

Step 2: Selection of random number which is less than or equal to the sampling interval.

Random number table or currency note technique could be used.

Example random number is 1051

Step 3: Cluster 1 has to be identified through the following methods; by locating the 1st village from the below table in which the cumulative population equals or exceeds the random number.

Cluster number has to be mentioned by the side of village in same table.

Identification of cluster 2: Random number + Sampling interval = 1,051 + 1,666 = 2,717

Identification of cluster 3: Number identified in the location of previous cluster + Sampling interval = 2,717 + 1,666 = 4,383

Step 4: List all villages and wards of the cities as well as population of the area of about 50,000 population where the evaluation as to be conducted are tabulated in the following ways:

Table 6.7: Village and its population.

Sl. No.	Name of the village	Population	Cumulative population	Cluster No.
1.	A	5,505	5,505	1, 2, 3
2.	B	4,006	9,511	4, 5, 6
3.	C	3,553	13,064	7, 8
4.	D	1,063	14,127	9
5.	E	4,054	18,181	10, 11
6.	F	4,569	22,750	12, 13, 14
7.	G	2,010	24,760	15, 16
8.	H	995	25,755	17
9.	I	5,107	30,862	18, 19
10.	J	4,506	35,368	20, 21, 22
11.	K	3,597	38965	23, 24
12.	L	2,548	41,513	25, 26
13.	M	1,678	43,191	27
14.	N	3,435	46,626	28, 29
15.	O	3,374	50,000	30

For evaluation of immunization status of the child following action should be undertaken.
Child coverage form and Reasons for coverage failure form has to be filled up. Document requirement:

- Child's birth registration certificate
- Mother and child protection card or record.
- The child coverage form is for children from 12 to 23 months of age. The earliest and latest acceptable date of birth are calculated by subtracting exactly 24 months and 12 months from the date of interview.
- In the child coverage form, the child numbers range from 1 to 10. The child number 8 to 10 have been included in case the 8th, 9th or 10th child were found in same household where the 7th child of the cluster was located.
- Then the data of 30 child coverage forms are collated in Child coverage summary form afterwards and Immunization coverage of DPT, Polio, Measles, BCG as well as vitamin A 1st dose was calculated. Coverage of other vaccines should be calculated if used.

CHILD COVERAGE FORM

District :
Cluster No. :
Cluster Name:

Range of dates of birth
From
Till

Child number in cluster		1	2	3	4	5	6	7	8	9	10	Total
Name												
Father's name and address												
Sex: M/F												
Sibling interval (months)												
Date of birth												
Immunization card	Yes											
	No											
DPT 1	Date											
	Source											
DPT 2	Date											
	Source											
DPT 3	Date											
	Source											
Polio 1	Date											
	Source											
Polio 2	Date											
	Source											
Polio 3	Date											
	Source											
Measles	Date											
	Source											
BCG	Date											
	Scar +/0											
	Source											
Vit A dose 1	Date											
	Source											
Whether fully immunized												

Source (place of immunization): HOS-Hospital, HC-Health Center, SC-Sub-center, OUT-Outreach or village and PRIV-Non-governmental or private sector facilities

Indicate against the column total the dose totals for each vaccine/vitamin A under the same five sub-headings, i.e., HOS/HC/SC/OUT/PRIV

Time begun: _____

Time completed: _____

Investigator's Name and Signature

Note: Pentavalent, MR, JE, IPV, PVD and Rota vaccine may be added fitting it with the vaccination schedule.

REASONS FOR COVERAGE FAILURE FORM

District :
Cluster No. :
Cluster Name:

Range of dates of birth
From
Till

	Child number in cluster	1	2	3	4	5	6	7	8	9	10	Total
Immunization status	1. Fully immunized											
	2. Partially immunized											
	3. Not immunized											
Lack of information	1. Unaware of need for immunization											
	2. Unaware of need to return for 2nd or 3rd dose											
	3. Place and/or time of immunization unknown											
	4. Fear of adverse reactions											
	5. Wrong notions on contraindications											
	6.											
Lack of motivation	1. Postponed till another time											
	2. No faith in immunization											
	3. Rumors											
Obstacles	1. Place too far											
	2. Time inconvenient											
	3. Vaccinator absent											
	4. Vaccine not available											
	5. Mother too busy											
	6. Family problem, mother ill											
	7. Child ill, not brought											
	8. Child ill, brought, not given											
	9. Long waiting time											
	10.											
Vitamin A prophylaxis	1. Prophylaxis given											
	2. Prophylaxis not given											
	3. Available Y/N/DK											

Note: Ask only one question, i.e., Why was the child not immunized? or
Why was the child not fully immunized?

Mark (/) the most relevant reason(s) according to your judgment.

Date:

Investigator's Name and Signature

F. **Lot quality assurance sampling (LQAS):** This technique was traditionally used for quality assurance purposes for assessing a variety of primary health care services, e.g., measuring immunization coverage. In this technique, survey would be carried in two or more sets with the same objective. All the different sets under study population will be different, i.e., belonging to different geographical areas and we will calculate the results from those sets of population with respect to defined objective and comparing the weighted results with a given assumptions which may be the same or different for different sets of population. Hence we can find out that which set of population gives acceptable results and which set gives unfavorable results, requiring urgent interventions, e.g., LQAS was used to determine the low vaccination coverage areas in 5 Cities in Bangladesh.

(Bulletin WHO, Vol. 79 (6), Geneva; 2001)

CM6.3: Describe, discuss and demonstrate test of significance in various study designs.

Hypothesis: It is an assumption or some supposition to be proved or disproved. But for a researcher hypothesis is a formal question that he/she intends to solve.

Example: Let us consider one statement:

"Students who receive counseling will show a greater increase in creativity than students not receiving counseling."

Test of hypothesis: It refers to the process of selecting and using a sample statistic, i.e., mean, median, mode, standard deviation or standard error to draw conclusion about a population parameter, based on observations on a sample.

Different steps in hypothesis testing:

- Making assumptions and setting up of a hypothesis
- Setting up suitable level of significance
- Setting up a test criterion (test of significance)
- Computation and drawing conclusions

Null Hypothesis: *(PBDSUHSH, 2013)*

- Null the hypothesis that there is no significant difference between specified population, any observed difference being due to sampling or experimental error. It can be defined as the hypothesis that the estimate is based solely on chance is called the null hypothesis. Thus, the null hypothesis is true if the observed data (in the sample) do not differ from what would be expected on the basis of chance alone. It is denoted by H_0
- Null hypothesis (H_0) is hypothesis of no difference. It means there is no difference between sample mean and population mean $H_0 = \mu$.
- Alternate hypothesis is denoted by (H_a) and sample mean is different or not equal to population mean $H_a \neq a$

There are two types of errors:

Type 1 error and Type II error in research.

(RUJH, 2022; VKSUAB, 2018, 2019)

Type 1: H_0 is rejected even though it is true
Type II: H_0 is not rejected even though it is false

Errors related to limitations of test of significance:

There can be four possibilities in testing of a hypothesis: (Fig. 6.15)

1. Hypothesis true-accepted—Correct decision
2. Hypothesis true-rejected—Type I error (α error)
3. Hypothesis false-accepted—Type II error (β error)
4. Hypothesis false-rejected—Correct decision

Decision	True state of nature: The null hypothesis is true	True state of nature: The null hypothesis is false
We decide to reject the null hypothesis	Type I error (rejecting a true null hypothesis) α	Correct decision
We fail to reject the null hypothesis	Correct decision	Type II error (rejecting a false null hypothesis) β

Fig. 6.15: Possibilities in testing of a hypothesis

Setting up suitable level of significance: It is the maximum tolerable probability of type I error. Since the type I error is quite serious particularly in the field of medicine when a therapeutic trial is done and a drug which is not effective is accepted on the basis of null hypothesis trial results. It is, therefore, necessary to fix a level of significance well in advance of the trial being conducted. We fix maximum tolerable probability for type I error (α) say 5% which is known as predetermined "level of significance" for α error (type I error).

***P* value:** It is based on statistical calculation, whereas level of α is fixed in advance or predetermined.

- If the *p* value is less than or equal to α result is inferred as statistically significant and we reject the null hypothesis (H_o).
- If the *P* is greater than α, we do not reject hypothesis (H_o). Type I error (α) is called "rejection error".

Setting up a test criterion: Next step is to select test of significance which is applied to the given data to give accurate results. To select a particular test of significance, it is necessary to identify the probability distribution of the sample and appropriate test statistic is selected.

Example: Student's "t", Fischer's "f" and chi-square, etc.

Computation and drawing conclusions: Final step in the testing of hypothesis is doing computations and drawing conclusion. In computation, the selected test statistic value is calculated, and is compared with the tabulated value pertaining to that statistic at a level of significance corresponding to the degree of freedom of the sample. Then we have to see whether the computed statistics values fall under zone of rejection or zone of acceptance.

- If the computed value lies in zone of acceptance, then we say that hypothesis is accepted and if it lies in zone of rejection then we say that hypothesis is rejected.
- If the value lies on the borderline zone, then the best step is not to draw any conclusion but draw other sample and investigate again.

Relationship between testing of hypothesis and confidence interval (CI):

The level of confidence is usually set up at 95%. The limits of confidence are fixed on either side of the mean, which we call as confidence limits with predetermined probability. If the population mean has normal distribution then, 95%, CI = mean ± 2SE, where SE refers to standard error of sample means.

Different statistical test to be applied:

A. Choice of a test according to sample size:
   a. For small samples:
      Sample size less than or equal to 30, in that case test of significance of choice are:
      - Student's 't' test (paired and unpaired)
      - Analysis of variance (ANOVA)
      - Non-parametric tests
   b. For Large samples:
      All tests which can be applied on small samples plus
      - 'z' test
      - Chi-square test, etc.

B. **According to type of data:**
   a. Quantitative data—t test, z test, ANOVA
   b. Qualitative data—Chi-square test, Kruskal-Wallis test, etc.

C. **According to probability distribution:**
   a. Normal distribution—z test
   b. Near normal distribution—t distribution—Student's test
   Chi-square distribution—Chi-square test
   Fisher's distribution—Fisher's-f test

D. **According to number of samples to be compared:**
   a. Comparison between two samples: t test, z test and chi-square test
   b. Comparison between more than two samples:
      - Chi-square test for qualitative data
      - ANOVA (analysis of variance) test for quantitative data

Q9. Chi-square test. *(TRIU, 2023; TDMGRMU, 2012; DU, 2008; SMU, 2013; SDVPG, 2022)*

Chi-square test involves the calculation of a quantity, called χ^2 in a qualitative data. It derived from the Greek letter 'chi' (χ) and pronounced as 'kye'.

- It is a non-parametric test of significance (elaborate).
- It offers an alternative method of testing the significance of difference between two variables. It has the advantage that it can be also used when more than two groups are to be compared.

Calculations:

- First a contingency table is prepared out of the qualitative data, where the actually observed frequencies of 2 sets of events are entered.
- Null hypothesis is set up stating there is no association between the events.
- Then expected frequency for each cell is calculated on the assumption of no association using the formula:

$$E = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}}$$

Then the difference between the observed and expected frequencies for each cell is found

- X^2 value for each cell is calculated by using the formula:

$$X^2 = \frac{(O - E)^2}{E}$$

- The total of X^2 for all the four cells is calculated by the formula (Summation of 4 cell X^2 Value):

$$\text{Total } X^2 = \sum \frac{(O - E)^2}{E}$$

- Where, a, b, c and d are observed frequencies of 4 cells and **G** is the grand total
- Degree of freedom (df) is calculated by using the formula: Degree of freedom = (No. of columns -1) (No. of rows -1)
- Lastly to know whether the calculated χ^2 value is significant or not, see the Fisher's χ^2 table readily available in the statistical textbook for a particular degree of freedom for a probability of 0.05, 0.01, etc.
- If the calculated value is higher than the tabulated value, then the association is significant.

Example: Apply χ2 test to find out the efficacy of a drug from the given data:

	Result		*Total*
Group	*Died*	*Survived*	
Control	(O) 10 (a)	(O) 25 (b)	35 (a + b)
	(E) (5.25)	(E) (29.75)	
Experimental	(O) 05 (c)	(O) 60 (d)	65 (c + d)
	(E) (9.75)	(E) (55.25)	
Total	15 (a + c)	85 (b + d)	G = (a + b + c + d) = 100

Calculate expected number and X^2 value of **"died"** in the control group

$$E_a = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}} = \frac{35 \times 15}{100} = 5.25$$

$$X^2 = \frac{(O - E)^2}{E} = \frac{(10 - 5.25)^2}{5.25} = 4.29$$

Expected number and X^2 value of **"survived"** in the control group is 29.75 **(E_b)** and 0.76 respectively.

In the same way, expected number and X^2 value of **"died"** in the experimental group is 9.75**(E_c)** and 2.31 respectively. Expected number and X^2 value of **"survived"** in the experimental group is 55.25**(E_d)** and 0.41 respectively.

Calculate the sum total of 4 cells

$$\sum X^2 = E_a + E_b + E_c + E_d = 4.29 + 0.76 + 2.31 + 0.41 = 7.77$$

Calculate degree of freedom = (2 - 1) (2 - 1) = 1

Find out the probability, by referring the Fisher's χ^2 table with 1 degree of freedom, the tabulated value corresponding to probability of 0.05 is 3.84.

Since the calculated value is more than tabulated value then there is a significant relationship between the two variables.

Importance of Chi-square test: The test of significance plays an important role in analysis of any epidemiological study by determining association between the two variables, example smoking and lung cancer, etc.

Q8a. Student's t-test *(TRIU, 2023)*

Ans: It was designed by **WS Gosset whose pen name was Student. Hence, it is also called Student's t-test.**

Application: It is applied to find the significance of difference in the following conditions:

- Between sample mean and population mean
- **Unpaired t-test** between two independent sample means
- **Paired t-test** between two related sample means

Criteria for applying t-test:

- Random samples
- Quantitative data
- Variable normally distributed
- Sample size less than 30

Unpaired t-test, Examples: Hb level of 54 girls and 72 boys student of class XII were shown below. Test whether the mean Hb levels of boys and girls differ or not.

Hb level of 54 girls (x) as follows:

10, 11, 12.5, 10.5, 12, 10, 12.5, 11.5, 11, 10.4, 10, 9.3, 11, 11. 9.5, 11, 10.5, 11.5, 10, 9.5, 11.2, 11, 9.2, 9.2, 10, 10.8, 11, 10.5, 10.1, 9, 10, 9.5, 12, 10.5, 11, 10, 10, 10, 10, 10.3, 10.9, 11, 9.5, 9,5, 8.5, 9, 10.5, 10.5, 10.5, 12, 11, 9.5, 11.

$$\text{Mean Hb level of 54 girls (x)} = \frac{10 + 11 + \ldots\ldots + 9.5 + 11}{54} = \frac{561.5}{54} 10.39\ g\%$$

Hb level of 72 boys (y) as follows:

10, 17.5, 14.2, 15, 14.1, 14, 14.5, 14.7, 14.5, 13.5, 14.5, 14.5, 14, 15, 16, 14, 14, 15.2, 14.2, 14, 14.2, 14, 14, 14.8, 14, 14.5, 13.3, 15.5, 14.5, 15, 15.5, 14.2, 14.8, 14, 14, 15.2, 14, 15, 14, 14, 15, 14.2, 14.5, 15.2, 14, 14.8, 15.2, 14.6, 14.7, 14.2, 14, 13.9, 14.9, 14.5, 14.5, 14.5. 14.5, 14.1, 15.3, 14.5, 14.7, 15, 14.5, 14.2, 17, 14.7, 14.5, 14.6, 13.8, 14.2, 15, 14.

$$\text{Mean Hb level of boys (y)} = \frac{10 + 17.5 + \ldots + 15 + 14}{72} = \frac{1043.2}{72} = 14.49$$

Assumption: The sample is adequate and we assume that Hb levels among boys and girls do not differ from one another.

Hypothesis:

- Null hypothesis: There is no significant difference between the mean Hb levels of boys and girls.
- Alternative hypothesis: Mean Hb levels of boys and girls differ significantly.

The level of significance for testing above mentioned hypothesis is fixed at 95%.

Choosing a test criterion and a test of significance. Test criterion chosen for hypothesis testing is the mean and as the data are appropriate and quantitative, so test of significance chosen is:
Unpaired 't' test/'z'test.

$$\text{'t' statistic} = \frac{\bar{X}_1 - \bar{X}_2}{s_p\sqrt{(1/n_1)+(1/n_2)}}$$

$$\text{Standard deviation of Hb levels of girls} = \sqrt{\frac{\Sigma(X-\bar{X})^2}{N_{1-1}}}$$

$$\frac{\sqrt{(10-10.39)^2+(11-10.39)^2+.....+(11-10.39)^2}}{54-1} = 0.9117$$

$$\text{Similarly, SD of Hb levels of boys} = \sqrt{\frac{\Sigma(y-\bar{y})^2}{N_{2-1}}}$$

$$\frac{\sqrt{10-14.4)^2+(17.5-14.4)^2+.....+(14-14.4)^2}}{72-1} = 0.8642$$

$n_1 + n_2 - 2 = 54 + 72 - 2 = 124$ df

In boys $\bar{Y} = 14.49$ and $s_1 = 0.8642$

In girls $\bar{X} = 10.39$ and $s_2 = 0.9117$

The pooled estimate: s_p = Pooled standard deviation

$$s_p = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}} = \sqrt{\frac{(54-1)\times(0.86)^2+(72-1)\times(0.91)^2}{52+74-2}}$$

$$= \sqrt{\frac{52.51 \quad 43.88}{124}} \quad \sqrt{\frac{96.39}{124}} = \sqrt{0.7.77} = 0.9$$

$$\text{'t' statistic} = \frac{10.39-14.49}{0.9\sqrt{(1/54+1/72)}} = \frac{-4.10}{0.9\sqrt{0.0139+0.0185)}}$$

$$\frac{4.10}{0.9\sqrt{(0.0324)}} = -25.37$$

Degree of freedom = 54 + 72 - 2 = 124

Table value of 't' statistic at 124 degree of freedom is 1.98.

't' calculated is > 't' critical

So, the difference is real and significant and hence, null hypothesis is rejected and alternative hypothesis is accepted.

Results: **The Hb levels of boys and girls in Class XII students differ significantly at $p < 0.05$.**

Paired t-test: Example

The weight of 10 Tuberculosis patients on admission and at the end of 12 months of treatment with PAS plus Isoniazid (INH) daily are given below. Comment whether the gain in weight is statistically Significant or not by applying paired t-test.

	Weight in kg		Difference		
Patients Sl no.	On admission (A)	After 12 months (B)	Weight X = B – A	$(x-\bar{x})$ Mean X = 4	$(x-\bar{x})^2$
1.	49	52	3	–1	1
2.	41	43	2	–2	4
3.	37	46	9	5	25
4.	41	52	11	7	49
5.	42	46	4	0	0
6.	37	38	1	–3	9
7.	39	42	3	–1	1
8.	38	41	3	–1	1
9.	41	42	1	–3	9
10.	35	38	3	–1	1
Total			**40**		**100**

The weight gain of 10 patients after 12 months is, 3, 2, 9, 11, 4, 1, 3, 3, 1 and 3 kg.

Total weight gain is 40 kg.

The mean weight gain is, 40 ÷ 10 = 4 kg

$$SD = \sqrt{\frac{\sum(X-\bar{X})}{n-1}} = \sqrt{\frac{100}{9}} = \frac{10}{3} = 3.33$$

$$SE = \frac{SD}{\sqrt{n}} = \frac{3.33}{\sqrt{10}} = \frac{3.33}{3.16} = 1.05$$

$$t_0 = \frac{\text{Mean observed difference}}{\text{SE of difference}} = \frac{4}{1.05} = 3.8$$

Degree of freedom (df) in paired t-test is n–1. So in the above example, df will be, 10–1 = 9

Referring to the table value of 't' at 9 df is 2.26, when $p < 0.05$. The observed value is 3.8.

Hence, the mean gain in weight is highly significant.

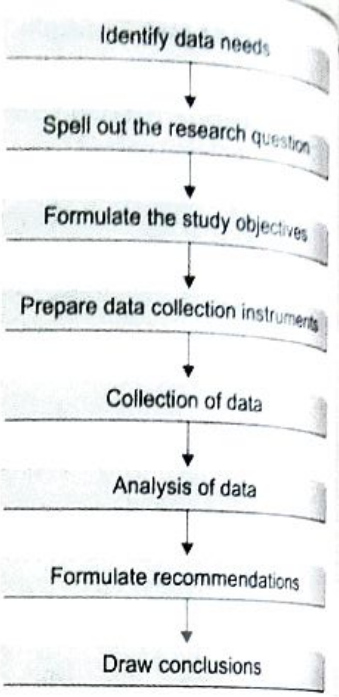
CM6.1: Formulate a research question for a study.

What is a research question?

A research question is an **uncertainty** about something in the population that the researcher wants to resolve by making measurements in the study population. The uncertainty is referred to as **data needs**. For any research, there is a life cycle.

Life cycle of research:
The following points should be taken into consideration while translating uncertainty to research question:

- Frame problem in specific terms like clinical/public health terms
- Should focus on one issue
- Should be written in everyday language
- Can be used more than one operational verb
- Should link the question to the potential action that would be taken once the question is answered.
- Is started as a question?



Framing a research question: Research question encompasses two basic elements: **Predictor** (independent) variable and **outcome** (dependent) variable.

Study population: The predictor variable is an intervention, risk factor or exposure while outcome variable is disease or effort such as change in knowledge, attitude or practice or utilization of services as also improvement in health status/condition, reduction of disease incidence/prevalence, etc.

Good research question should pass the 'so what?' test: The test comprises five elements, it is called FINER.

- Feasible
- Interesting
- Novel
- Ethical
- Relevant

Framing and refining a research question requires a thorough review of literature from library, journals, published reports/survey and computerized electronics bases such as Medline, Embase, Scopus, etc.

Research protocol: Research protocol should be framed in **PICOT** format which is based on evidence-based research.

P—Study participants/population
I—Interventions
C—Control group
O—Outcome
T—Time frame

Research protocol should be approved by institutional ethics committee (IEC). Research protocol should be written under following headings:

Objectives of the study: Objectives should be specific, measurable, achievable, relevant, time bound (SMART). Limit to one or two objectives.

Materials and methods:

- **Materials:** Study population-sample frame, sample size and sampling method-case and controls, inclusion and exclusion criteria.
- **Methods:** Types of study-descriptive, analytical, cross-sectional, case-control study, cohort study, Ecological, experimental-RCT, field trial.
- **Informed consent:** Informed consent from participant is mandatory.

Method of data collection: Observation, interviews, questionnaire, focus group, clinical examination, laboratory test, survey.

Data processing: Various statistical methods are used for data processing-summarization and data analysis and data presentation by tables and graphs/figures. Right from the planning stage of protocol, statistical analysis is an important aspect.

Results: Interpretation of data and results.

Conclusions and recommendations: Sharing the results with the participants and health administration. Also suggest future research area based on present study results.

Example of research question:
What is the burden of acute watery diarrhea in young children?

Objectives: To estimate incidence of acute watery diarrhea episodes in children below 3 years of age in last 2 weeks.

In methodology part the investigator must define:
- What is an episode of acute watery diarrhea?
- Who are the young children (age group)?
- What kind of study design will be applicable?
- What will be the sample size?

SHORT NOTES AND RELEVANT QUESTIONS

Q10. Uses of Biostatistics in Public Health *(BUMP, 2013)*/**Usages of statistics in medical research.** *(RUJH, 2010)*

Ans: a. To test usefulness of sera and vaccines in the field-percentage of attacks or deaths among the vaccinated subjects is compared with that among the unvaccinated ones to find whether the difference observed is statistically significant.

b. In epidemiological studies, the role of causative factors is statistically tested. Deficiency of iodine is an important cause of goiter in a community is confirmed only after comparing the incidence of goiter cases before and after giving iodized salt.

c. In public health, measures are adopted and it is evaluated. Lowering of morbidity rate in typhoid after pasteurization of milk may be attributed to clean supply of milk, to prove statistically. Fall in birth rate may be result of family planning methods adopted under National Family Welfare Program or due to rise in living standards, increasing awareness and higher age of marriage.

Thus by learning the methods in biostatistics, a student learns to evaluate articles published in medical journals or paper read in medical conferences. He understands the basic methods of observation in his clinical practice or research.

Q11. Hospital statistics are considered a poor guide for estimation of a disease frequency in a community. *(WBUHS, 2019)*

Ans: Hospital statistics are considered a poor guide due to following reasons:

a. They constitute only the tip of the iceberg

b. No catchment area is surveyed by hospital, so it provides the numerator but not the denominator

c. Admission policy may vary from hospital to hospital

d. Extrapolation of hospital data to an entire community is considered poor guide for estimating frequency of a disease in that community.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **A _____ is a subset of population.** (KIMS, 2015)
   a. Sample b. Statistic c. Error d. Parameter

2. **The process by which some members of a population are selected as representative of the entire population is known as:**
   a. Census b. Sampling c. Survey d. Randomization

3. **Sampling achieves:**
   a. Efficient utilization of resources
   b. Elimination of random error
   c. Accurate results
   d. Complete enumeration of population

4. **A researcher conducted a study and wants to extrapolate the findings of the study to which of the population?**
   a. Target population b. Accessible population c. Sample d. Universe

5. **A sample is taken for which of the following reasons?**
   a. To obtain information from small populations
   b. To ensure the efficiency of a study
   c. To study all units in the population
   d. To ensure internal validity

6. **Which one of the following biases is prevented by an appropriate sampling technique?**
   a. Volunteer bias b. Interviewer's bias c. Social desirability bias d. Recall bias

7. **Which of the following is a type of probability sampling?**
   a. Simple random sampling
   b. Consecutive sampling
   c. Convenience sampling
   d. Purposive sampling

8. **Which of the following is a type of non-probability sampling?**
   a. Systematic sampling
   b. Stratified sampling
   c. Cluster sampling
   d. Respondent driven sampling

9. **Which of the following sampling methods are used in qualitative research?**
   a. Stratified sampling
   b. Cluster sampling
   c. Simple random sampling
   d. Purposive sampling

10. **In simple random sampling, the probability of selection of each individual is:**
    a. Unequal b. Equal c. Unknown d. One

11. **Which of the following is correct regarding simple random sampling?** (ABKUB, 2018)
    a. Providers least number of possible samples
    b. Equal chance to each for collection of certain number for a sample
    c. Picking every 5th or 10th at regular intervals
    d. Sample represent, a corresponding strata of universe

12. **Which of the following about simple random sampling method is false?**
    a. It needs a complete list of the units in the target population
    b. Purposive sampling is a type of simple random sample
    c. It draws units from the target population randomly
    d. It gives equal chance of selection to every unit in the target population

13. **In a neighborhood with 5000 houses, a researcher wants to obtain a systematic random sample of 50 houses. What will be the sampling interval in this case?**
    a. 1000
    b. 100
    c. 0.1
    d. 0.01

14. **Which one of the following about stratified random sampling is false?**
    a. Units within a strata are homogenous
    b. Sample is taken from every strata
    c. Precision improves with low numbers sampled in each stratum
    d. Stratum specific estimates are weighted to obtain the overall estimate

15. **Which of the following sampling method ensures that valid conclusions can be drawn about different subgroups in a population?**
    a. Simple random sample
    b. Systematic random sample
    c. Stratified random sample
    d. Cluster random sample

16. **Which one of the following statement about cluster sampling is false?**
    a. Units within a cluster are heterogenous
    b. Sampling frame of the entire study area is not required
    c. Variability between clusters is assumed to be high
    d. Sampling error is difficult to measure

17. **Design effect is considered for which of the following sampling strategy?**
    a. Cluster sampling
    b. Simple random sampling
    c. Stratified random sampling
    d. Non-probability sampling

18. **Which of the following statements is true about multistage sampling?**
    a. Commonly done for small populations
    b. Sampling error can be measured
    c. Complete enumeration of the population is needed
    d. Is often done when it is expensive to cover the entire population

19. **Which one of the following statements about multistage sampling is true?**
    a. It saves resources as compared to simple random sampling
    b. It requires a complete listing of the entire population
    c. It's sampling error can be easily measured
    d. It is not suitable for sampling from a large population

20. **Which of the following helps to minimize the random error in a research study?**
    a. Limited study duration
    b. Adequate sample size
    c. Adequate budget
    d. More than six investigators

21. **Which of the following statements on study populations is true?**
    a. Study sample is a subset of the accessible population
    b. Target population is a subset of the accessible population
    c. Accessible population is a subset of the study sample
    d. Target population is a subset of the study sample

22. **Which of the following is the accessible population in the following study?**
    a. All children aged <5 years in the city
    b. All circumcised children aged <5 years in the city
    c. All circumcised children aged <5 years attending the government hospital
    d. All children having UTI in the city

23. **The degree to which the observed findings lead to correct interference about phenomena of interest in the study sample is:**
    a. Reliability
    b. Feasibility
    c. Internal validity
    d. External validity

24. Which of the following factors is not essential for calculating sample size for a single mean estimation?
a. Need for statistical significance
b. Assumptions about population standard deviation
c. Precision
d. Significance level

25. Adjustments to a calculated sample size need not be done for which of the following reasons?
a. Non-response rate
b. Finite population size
c. Cluster design
d. Study setting (hospital/community)

26. What is Type I error?
a. The probability of accepting the null hypothesis when it is false
b. The probability of rejecting the null hypothesis when it is true
c. The probability of rejecting the null hypothesis when it is false
d. The probability of accepting the null hypothesis when it is true

27. A type-II error occurs when:
a. The null hypothesis is rejected when it is false
b. The null hypothesis is not rejected when it is false
c. The null hypothesis is not rejected when it is true
d. The null hypothesis is rejected when it is true

28. Ability of a study to detect correctly the presence of an association is known as:
a. Precision
b. Power
c. Confidence
d. Significance

29. All are test of significance, *except*: *(GITAMAP, 2023)*
a. Standard deviation
b. Standard error of mean
b. Standard error of proportion
d. Standard error of difference

30. Most commonly used measure of central tendency is:
a. Mode
b. Median
c. Mean
d. Range

31. Age of ten pregnant women who visited an ANC clinic are given below. What is the mean age of this group? (26, 31, 25, 26, 30, 27, 25, 32, 25 and 33 years)
a. 45
b. 28
c. 25
d. 32

32. Variance is always preferred to calculate deviations from _____.
a. Mode
b. Variance
c. Median
d. Mean

33. When the data set contains too many extreme values, the most representative average value is:
a. Mean
b. Mode
c. Median
d. Variance

34. The following scores were obtained by nine medical students in a quiz: (7, 3, 6, 9, 4, 8, 10, 12, 11) What is the median score of this group?
a. 3
b. 8
c. 8.5
d. 11

35. The following scores were obtained by ten medical students in a quiz: (5, 3, 6, 8, 7, 8, 3, 11, 6, 3) What is the median score of this group?
a. 3
b. 6
c. 8
d. 11

36. Which of the following statistics does not belong with the others?
a. Range
b. Variance
c. Mode
d. Standard deviation

37. Which of the following about 'Range' is true?
a. It indicates the way in which values cluster about a particular point
b. It gives the number of observations bearing the same value
c. It is the difference between the minimum and maximum value
d. It shows the degree to which the mean value differs from its expected value

38. **The average of the absolute deviations of the observation from the arithmetic mean is known as:**
a. Variance b. Inter-quartile range c. Mean deviation d. Standard deviation

39. **Square root of the average of the squared deviations of the observations from the arithmetic mean is known as:**
a. Variance b. Inter-quartile range c. Mean deviation d. Standard deviation

40. **Which one of the following measurements does not divide a set of observations into equal parts?**
a. Quartiles b. Standard deviation c. Percentiles d. Median

41. **10 babies were born in a hospital on same day. All weigh 2.8 kg each. The standard deviation is:** *(ABKUB, 2015, 2020)*
a. Zero b. One c. Minus one d. 0.28

42. **The following measure is not influenced by extreme values in a data set:**
a. Arithmetic mean b. Inter-quartile range c. Range d. Both b and c

43. **What is the appropriate measure of dispersion to report when median is reported as the measure of central tendency for a given set of data?**
a. Standard deviation b. Inter-quartile range c. Variance d. Coefficient of variance

44. **First quartile (Q1) is equivalent to _____ percentile.**
a. 25th b. 50th c. 75th d. 1st

45. **Which of the following is a relative measure of dispersion when comparing variables which are measured in different units?**
a. Inter-quartile range b. Coefficient of variation c. Range d. Standard deviation

46. **If the mean is 25 and the standard deviation is 5 then coefficient of variation is _____.**
a. 100% b. 25% c. 20% d. None of these

47. **If the mean cholesterol value of a group of normal subjects is 230 mg with a standard error of 20. The 95% confidence limit for the population is:** *(ABKUB, 2020)*
a. 220–240 b. 210–250 c. 200–260 d. 190–270

48. **Degree of freedom is calculated by the formula: [C = No. of column, R = No. of Rows]** *(SAMU, 2016)*
a. (C-2) × (R-2) b. (C-1) × (R-1) c. (C-3) × (R-3) d. (C-4) × (R-4)

49. **Quantitative data can be best represented by:** *(VKSUAB, 2021)*
a. Pie chart b. Pictogram c. Histogram d. Bar diagram

50. **A physician studied the association between plasma level of rennin and changes in BP. The data can be represented by:** *(ABKUB, 2020)*
a. Scatter diagram b. Pie chart c. Line diagram d. Histogram

51. **Histogram is used to describe the:** *(ABKUB, 2017)*
a. Quantitative data of a group of patients b. Qualitative data of a group of patients
c. Data collected on nominal scale d. Data collected on ordinal scale

52. **The diagram used to show the trend of events with passage of time is:** *(YSRUHSAP, 2023)*
a. Line diagram b. Histogram c. Pictogram d. Bar diagram

53. **_____ diagrams are used to present the trends of events with passage of time.** *(GITAMAP, 2023)*
a. Pictogram b. Pie chart
c. Histogram d. Line diagram

54. **Normal distribution curve is determined by:** *(ABKUB, 2018)*
a. Standard deviation and mean b. Standard deviation and mode
c. Mode and median d. Standard deviation and median

55. Identify the type of variable in this question. "Have you ever smoked cigarettes? 1. Yes, 2. No

a. Categorical b. Ordinal c. Continuous d. Discrete

56. In a study on cancer, the 'stage of cancer' was recorded as Stage I, Stage II, Stage III and Stage IV. Which of the following variable types best describes the 'stage of cancer'?

a. Nominal b. Ordinal c. Categorical d. Continuous

57. In a survey, socioeconomic status (SES) was collected in the following manners - 'Lower, Lower Middle, Upper Middle and Upper'. What type of variable is SES? *(AFUH, 2023)*

a. Ordinal b. Nominal c. Continuous d. Discrete

58. Classifying a disease as mild, moderate and severe is following scale of measurements: *(ABKUB, 2004)*

a. Normal b. Ordinal c. Interval d. Ratio

59. All the following are examples of a nominal variable, *except*:

a. Gender b. Age c. Place of residence d. Color of eyes

60. Which of the following variable is not categorical? *(KIMS, 2013)*

a. Age of person b. Gender of a person b. Marital status d. Choice of a test item

61. Researchers are interested in measuring the cholesterol levels of participants in a study. Cholesterol level is a _____.

a. Ordinal b. Nominal c. Continuous d. Discrete

62. Which of the following variable is discrete in nature?

a. Age b. Family size c. Height d. Weight

63. Identify the type of the question. "How do you spend your leisure time? _____ (Write any two activities)"

a. Open-ended b. Closed

c. Semi-open d. Open question with closed answers

64. Identify the type of question. 'How would you describe your pain on a scale of 1-10 where, 1 would be the minimum and 10 would be the maximum?

a. Closed question b. Open question with closed ended answers

c. Open question d. Semi-open question

65. What is the type of the question? From where do you usually get health-related information? i. Television, ii. Radio, iii. Newspaper, iv. Magazine, v. Others (specify) _____

a. Open-ended b. Closed

c. Semi-open d. Open question with closed answers

66. Which of the following is true about 'Open question with closed answers'?

a. Its answers are not suggested to the participants b. It can be used in a self-administered questionnaire

c. It is analyzed like an open-ended question d. It is expressed as a closed question to the participants

67. Which of the following can be used to represent the duration, timeline and sequence of activities and milestones of a research project?

a. Bar chart b. Histogram c. Gantt chart d. Pie chart

68. Which of the following is false about Unique Identifier (ID)?

a. It can be same for more than one participant in a study

b. It can be alphanumeric

c. It can be a composite number

d. It can be used to maintain the anonymity of participants

69. **Who is primarily responsible for resource allocation and time management in a study?**
a. Institute where the research is conducted
b. Principal investigator
c. Funding agency
b. Scientific committee

70. **The ability of an instrument to produce similar results on repeated measurement is called:**
a. Validity
b. Reliability
c. Accuracy
d. Internal validity

71. **The ability of a tool to correctly measure what it is supposed to measure is called as:**
a. Precision
b. Validity
c. Reliability
d. Consistency

72. **Obtaining an accurate estimate of disease frequency and effect of exposure on health outcomes in a study population pertains to:**
a. External validity
b. Internal validity
c. Bias
d. Confounding

73. **Obtaining an estimate that is generalizable to relevant study population in a research study is:**
a. External validity
b. Internal validity
c. Bias
d. Confounding

74. **External validity of an experiment refers to which of the following?**
a. Results have been obtained from cross cultural studies
b. Results are generalizable to the general population
c. Experiments were performed in the laboratory
d. Results are replicable

75. **Which of the following is an ideal situation in a health research with respect to the study results?**
a. Not reliable, accurate
b. Not accurate, reliable
c. Not accurate, not reliable
d. Accurate, reliable

76. **Which of the following is ideally the first step in developing a study?**
a. Fixing the title
b. Formulating the research question
c. Writing the background
d. Planning for analysis

77. **Before initiating a study involving primary data collection, the principal investigator must ensure that various approvals are obtained. Which of the following approvals is absolutely mandatory?**
a. Scientific committee approval
b. Ethics committee approval
c. Technical committee approval
d. Regulatory authority approval

78. **Which of the following review is not essential before initiating a research study?**
a. Scientific review
b. Peer review
c. Regulatory review
d. Ethics review

79. **Which of the following is not a component of a research study?**
a. Setting up institute scientific committee
b. Calculating sample size
c. Development of a study tool
d. Framing the research question

80. **Which of the following is false about formulating questions in a study tool?**
a. They must be concise and precise
b. They must use scientific terms
c. They must use a neutral tone
d. They must avoid double negatives

81. **Identify the correct statement about implementation of a research:**
a. Research findings must be approved by the funder
b. Research finding must be error free
c. Adequate sample size is a prerequisite
d. Pilot study can be done during data analysis stage

82. **Which of the following statements is not correct regarding errors in health research?**
a. Random error is due to chance
b. Systemic error is due to bias
c. Random errors can be eliminated by random sampling
d. Bias distorts the study results in one direction

83. Which of the following is not a critical consideration in planning health research?
a. Adequate justification
b. Clear and focused research question
c. Standard case definitions
d. Financial gain

84. A clear research question is required in order to facilitate the following:
a. To choose an optimal study design
b. To identify the outcomes that need to be measured
c. To decide when the outcomes need to be measured
d. All the above

85. Characteristics of a good hypothesis are all, *except*:
a. There should be no ambiguity about the study variables
b. It should be stated 'a priori'
c. It can be revised based on the study findings
d. It should specify one exposure and one outcome

86. Which of the following is true for a 'Descriptive Research Question'?
a. Involves observations to measure a quantity
b. Involves comparison groups
c. Tests the efficacy of interventions
d. Requires hypothesis testing

87. Which of the following characteristics best describe a good research question?
a. Feasible, Novel, Ethical
b. Feasible, Noble, Ethical
c. Ethical, Novel, Intuitive
d. Fantastic, Novel, Relevant

88. All the following are components of 'FINER' criteria for a research question, *except*:
a. Feasible
b. Novel
c. Ethical
d. Reliable

89. Which of the following statements about study objective/s is false?
a. Objectives are stated in scientific terms
b. Objectives can be primary and secondary
c. Each objective is written using multiple verbs
d. Objectives should be specific

90. How can the given study objective be improved? "To understand the anemia in pregnancy"
a. Using appropriate action verb
b. Specifying the outcome measure
c. Specifying the study setting and time period
d. All the above

91. Which of the following is not a step in framing an ideal research question?
a. Literature review
b. Peer review
c. Broadening/sharpening the initial question
d. Defining measurable outcomes

92. All are source(s) of research question, *except*:
a. Published literature
b. Being alert to new ideas
c. Careful observation and teaching
d. Personal experiences

93. What is the first step in the life cycle of research?
a. Spelling out the research question
b. Identifying the data needs
c. Formulating the objective of the study
d. Choosing the study design

94. In the life cycle of research, "spelling out the research question" is followed by:
a. Preparing data collection instrument
b. Formulating study objectives
c. Collecting data
d. Formulating recommendation

95. What is the last step in the cycle of research?
a. Spell out the research question
b. Formulate the objective of the study
c. Formulate recommendations
d. Choose the study design

96. When we are formulating a research question we should consider the following points, *except*:
a. Use specific terms to describe the problem
b. Preferably focus on multiple issues
c. Write in everyday language
d. Use more than one operational verb, if needed

97. **A researcher conducts a review of literature to identify a set of potentially useful articles and books related to their research topic. This process is known as:**
a. Indexing b. Critical appraisal c. Data management d. Information seeking

98. **What is the logic of inquiry in qualitative research?**
a. Deductive b. Objective c. Inductive d. Statistical

99. **Which of the following is an action verb commonly used while framing a qualitative objective?**
a. To estimate b. To determine c. To explore d. To predict

100. **Which of the following characteristics is not related to qualitative research data?**
a. Subjective validity
b. Data is in text form
c. Hypothesis testing is a goal
d. It involves interpretation of responses

101. **Which of the following cannot be done using qualitative research?**
a. Viewing a social phenomenon holistically
b. Estimating the burden of a disease
c. Seeking in-depth understanding of a phenomenon
d. Unfamiliar subject matter

102. **Which of the following is not a data collection method used in qualitative research?**
a. Interviews
b. Sociogram
c. Participant observation
d. Focus group discussion

103. **Which of the following is not a feature of 'In-depth interviews'?**
a. It involves two or more participants at a time
b. It follows an interview guide
c. It is suitable for a highly sensitive topic
d. It obtains rich contextualized information

104. **Which of the following is true regarding 'participant observation' method?**
a. It is easy to analyze the data
b. The researcher himself becomes a part of the study group
c. Data obtained is very concise
d. The researcher interviews each participant in detail

105. **The analytical approach where the researcher proceeds to develop a theory based on learnings obtained from the data is called:**
a. Grounded theory analysis
b. Content analysis
c. Schema analysis
d. Factor analysis

106. **Which of the following is a method of analyzing qualitative data?**
a. Regression analysis b. Content analysis c. Univariate analysis d. Multivariable analysis

107. **Which of the following qualitative techniques requires homogenous participants?**
a. Focus group discussion
b. In-depth interview
c. Participant observation
d. Key informant interview

108. **A researcher wanted to conduct a prospective study on the dietary practices of toddlers admitted to a nutritional rehabilitation center. Which of the following is an appropriate method for data collection?**
a. Focus group discussion
b. Document analysis
c. Participant observation
d. Ethnography

109. **A researcher decided to conduct a study on domestic abuse among homemakers in a village during the COVID-19 pandemic. Which of the following is an appropriate method to use for data collection?**
a. Participant observation
b. In-depth interview
c. Focus group discussion
d. Key informant interview

110. Which of the following search query in PubMed will give relevant articles for the following question "What is the burden of gastroenteritis among children?"

a. Gastroenteritis OR children
b. Gastroenteritis AND children
c. Gastroenteritis BUT children
d. Gastroenteritis NOT children

111. Which of the following search query should be used to find the articles on chest pain other than angina?

a. Chest pain AND angina
b. Chest pain OR angina
c. Chest pain NOT angina
d. Chest pain EXCEPT angina

112. Which of the following Boolean operator will give the highest number of results when used between two given search terms?

a. AND b. NOT c. OR d. ALL

113. Which of the following Boolean operators is used for connecting two keywords, the latter of which needs to be excluded from searches?

a. AND b. OR c. NOT d. BUT

114. The organized collection of articles, abstracts, scientific proceedings, books, and citations used for the purpose of literature review, is known as:

a. Database b. Data management c. Critical appraisal d. Index

115. In the National Library of Medicine (NLM), MeSH means:

a. Medical services Heading
b. Medical subject Heading
c. Medical subject Helpline
d. Medicine subject Helpline

116. Medical Subject Headings is a controlled vocabulary thesaurus used for indexing articles in:

a. PubMed b. Google scholar c. Scopus d. Health on Net

117. Which among the following is not generally reported in the table of literature review?

a. Study design b. Study population c. Primary outcomes d. Impact factor

118. Which among the following is not a search engine for retrieving published medical literature?

a. PubMed b. Ovid c. Google Scholar d. Mendeley

119. Which of the following ethical principle insists the voluntary decision of an individual to participate in a research?

a. Beneficence b. Non-maleficence c. Autonomy d. Justice

120. Informed consent primarily deals with which of the following ethical principle?

a. Autonomy b. Justice c. Beneficence d. Non-maleficence

121. Which of the following ethical principles suggests that the research plan should be fair and correct to everyone irrespective of any socio, demographic, and cultural factors?

a. Justice b. Autonomy c. Beneficence d. Non-maleficence

122. Do no harm' implies to which of the following ethical principle?

a. Beneficence b. Non-maleficence c. Autonomy d. Justice

123. Which of the following is recommended when a study participant is illiterate and cannot sign the informed consent form?

a. Informed consent process can be skipped
b. Need to have an impartial witness
c. Exclude the individual from participation
d. Field investigator can sign the form

124. The initial outline of the research protocol is also called _____.

a. Concept paper b. Abstract c. Poster presentation d. Summary

125. Written plan for a research is known as _____.

a. Manuscript b. Protocol c. Commentary d. Critical appraisal

126. **Which of the following are components of a concept paper?**
a. Study title and references
b. Study title, abstract and references
c. Abstract and references
d. Study title, results and references

127. **Which of the following is a consideration in framing the objectives of a concept paper?**
a. Choosing appropriate action verbs
b. Calculating sample size based on the secondary objectives
c. Stating broad objectives
d. All the above

128. **Altering the original data to obtain a statistically significant result by the researcher is known as:**
a. Fabrication b. Falsification c. Fascination d. Fasciation

129. **A postgraduate in a medical college submitted a proposal to the ethics committee of the institute. The committee found that the proposal is a near copy of an earlier proposal from the same department. This act of the PG can be best termed as:**
a. Fabrication
b. Falsification
c. Plagiarism
d. Breach of confidentiality

130. **Submitting a manuscript to more than one journal at the same time is known as:**
a. Duplicate publication
b. Self-citation
c. Simultaneous publication
d. Peer review

131. **According to the National Ethical Guidelines for Biomedical and Health research involving human participants, 2017, how long a researcher should preserve the case report forms for an observational study?**
a. 1 year b. 3 years c. 5 years d. 10 years

132. **The requirement of a sample are:** *(MGUB, 2023, 2024)*
a. It should be adequately large
b. It should be representative
c. Both of the above
d. None of the above

133. **Which of the following is not a random sampling method?** *(SSUHSA, 2023)*
a. Simple random sampling
b. Quota sampling
c. Cluster sampling
d. Stratified sampling

134. **Which of the following is also called "interval sampling"?** *(WBUHS, 2023)*
a. Simple random sampling
b. Systemic random sampling
c. Stratified random sampling
d. Snowball sampling

135. **Type-I sampling error is classified as:** *(TRIU, 2023)*
a. Alpha error b. Beta error c. Gamma error d. Delta error

136. **All are measures of Central Tendency, *except*:** *(SSUHSA, 2024)*
a. Mean b. Median c. Mode d. Standard deviation

137. **Which of the following is not a measure of dispersion?** *(KIMS, 2019)*
a. Median b. Range c. Standard deviation d. Mean deviation

138. **95% of the values in a standard normal curve lies between:** *(GOAU, 2023)*
a. 1 SD
b. 2 SD
c. 3 SD
d. 4 SD

139. **Spot the one that is not a measure of variation:** *(KIMS, 2023)*
a. Standard deviation
b. Variance
c. Coefficient of variation
d. Weighted mean

140. Which of the following is used to denote/represent the frequency of a continuous variable? *(TRIU, 2023; GOAU, 2023)*

a. Simple bar
b. Histogram
c. Pie diagram
d. Component bar chart
e. Line diagram

141. Graph showing relation between two variables is: *(WBUHS, 2024; MGUB, 2024)*

a. Scatter diagram b. Bar diagram c. Line diagram d. Pie diagram

142. Graph to correlate two quantitative data is: *(VNSGUS, 2023)*

a. Histogram b. Scatter diagram c. Line diagram d. Frequency curve

143. Suitable diagram to represent qualitative data are all *except*: *(AKUB, 2023)*

a. Bar diagram b. Pie diagram c. Histogram d. Pictogram

144. While analyzing data, allocation into similar groups is done to ensure: *(GOAU, 2023)*

a. Comparability b. Accuracy c. Validity d. Sensitivity

145. The 4th year MBBS students conducted a study on " Prevalence of mother about neonatal jaundice". They went to pediatric OPD and ward and took sample of 100 available mothers. Such type of sampling technique is: *(AKUB, 2024)*

a. Systematic b. Stratified c. Convenience d. Cluster

146. A qualitative variable having an inherent order to, it is classified as: *(TRIU, 2024)*

a. Interval scale b. Ordinal scale c. Ratio scale d. Polynomial scale

147. Diagnostic power of the test is reflected by: *(ABKUB, 2023)*

a. Sensitivity
b. Specificity
c. Predictive value
d. Population attributable risk

148. Most important Significance test to test the strength of association between variables is: *(DBRAUA, 2024)*

a. Standard error of difference of mean
b. Regression coefficient test
c. t-test (student's test)
d. Chi-square test

Answers:

1.	a	**2.**	b	**3.**	a	**4.**	d	**5.**	b	**6.**	a	**7.**	a	**8.**	d	**9.**	d	**10.**	b
11.	b	**12.**	b	**13.**	b	**14.**	c	**15.**	c	**16.**	c	**17.**	a	**18.**	d	**19.**	a	**20.**	b
21.	a	**22.**	c	**23.**	c	**24.**	a	**25.**	d	**26.**	b	**27.**	b	**28.**	b	**29.**	a	**30.**	c
31.	b	**32.**	d	**33.**	c	**34.**	b	**35.**	b	**36.**	c	**37.**	c	**38.**	c	**39.**	d	**40.**	b
41.	a	**42.**	b	**43.**	b	**44.**	a	**45.**	b	**46.**	c	**47.**	d	**48.**	b	**49.**	d	**50.**	c
51.	a	**52.**	a	**53.**	d	**54.**	a	**55.**	a	**56.**	b	**57.**	a	**58.**	b	**59.**	b	**60.**	a
61.	c	**62.**	b	**63.**	a	**64.**	a	**65.**	c	**66.**	a	**67.**	c	**68.**	a	**69.**	b	**70.**	b
71.	b	**72.**	b	**73.**	a	**74.**	b	**75.**	d	**76.**	b	**77.**	b	**78.**	b	**79.**	a	**80.**	b
81.	c	**82.**	c	**83.**	d	**84.**	d	**85.**	c	**86.**	a	**87.**	a	**88.**	d	**89.**	c	**90.**	d
91.	c	**92.**	d	**93.**	b	**94.**	b	**95.**	c	**96.**	b	**97.**	d	**98.**	c	**99.**	c	**100.**	c
101.	b	**102.**	b	**103.**	a	**104.**	b	**105.**	a	**106.**	b	**107.**	a	**108.**	a	**109.**	b	**110.**	b
111.	c	**112.**	c	**113.**	c	**114.**	a	**115.**	b	**116.**	a	**117.**	d	**118.**	d	**119.**	c	**120.**	a
121.	a	**122.**	b	**123.**	b	**124.**	a	**125.**	b	**126.**	b	**127.**	a	**128.**	b	**129.**	a	**130.**	c
131.	d	**132.**	c	**133.**	b	**134.**	b	**135.**	a	**136.**	d	**137.**	a	**138.**	b	**139.**	d	**140.**	b
141.	a	**142.**	c	**143.**	c	**144.**	a	**145.**	c	**146.**	b	**147.**	c	**148.**	d				

FILL IN THE BLANKS

1. Normal distribution curve has the shape of a _____ an area of one. *(VKSUAB, 2016)*
2. In a normal distribution curve _____ lie at one point. *(SAMU, 2011)*
3. Measures of dispersion are _____ . *(SAMU, 2012)*
4. The most frequently used measure of deviation is _____. *(KIMS, 2015)*

Answers:

1. Bell
2. Mean, Median and Mode
3. Range, Interquartile range, Mean deviation and Standard deviation
4. Standard deviation

TRUE/FALSE

1. Mode is most frequently occurring observation in a series. *(SAMU, 2015)*
2. Normal distribution curve is bell-shaped. *(SSUHSA, 2023)*

Answers:

1. True
2. True

CHAPTER

7

Epidemiology

CM7.1: Define epidemiology and describe and enumerate the principles, concepts and uses of epidemiology.

Q1. Define epidemiology. *(WBUHS, 2010, 2016, 2017, 2018, 2019, 2021, 2022; AKUB, 2022; BNMUB, 2017, 2018, 2020; ABKUB, 2011, 2015; GNSUB, 2022; RGUHS, 2014; TRIU, 2015, 2020; TDMGRMU, 2012, 2015; KIMS, 2021; SAMU, 2011, 2016; BUMP, 2008; SMU, 2012, 2015; NU, 2016, 2017; DU, 2011, 2013; SSUHSA, 2018, 2023; MU, 2019, 2022; MUHS, 2019; SDVPG, 2023; MGUB, 2023; VBUJH, 2022; AFUH, 2023; VNSGUS, 2023)*

Ans: Definition of epidemiology by John M Last in 1988 as, **"It is the study of the distribution and determinants of health-related states and events in a specified population and application of this study to the control of health problems". Epidemiology derived from the word epidemic [epi = among; demos = population; logos = study].**

Q2. Mention the aims and objectives of epidemiology. How is it applied in public health practice, state with example? *(BNMUB, 2005; SAMU, 2004)*

Ans: Aims of epidemiology:

- To know the distribution of disease in the community
- To know the magnitude of problem
- To identify the etiological and risk factors in development of disease
- To plan for prevention and control measures
- To evaluate the control measures

Ultimately the aim is for the health and well-being of the people.

Objectives of epidemiology:

- First, to identify the etiology or cause of a disease and the relevant risk factors—that is, factors that increase a person's risk for a disease.
- Second, to determine the extent of disease found in the community.
- Third, to assess the natural history and prognosis of disease.
- Fourth, to evaluate both existing and newly developed preventive and therapeutic measures and modes of healthcare delivery.
- Fifth, to provide the foundation for developing public policy relating to environmental problems, genetic issues, and other considerations regarding disease prevention and health promotion.

Principle and concept of epidemiology: In public health practice, the epidemiologist dissolves the problems of health and disease in the following approaches, by asking questions and making comparisons:

1. What is the event/extent of problem? (Nature of disease/Magnitude)
2. When did the disease occur? (Time distribution of the disease)
3. Where did the disease occur? (Place distribution of the disease)
4. Who are the persons affected? (Person distribution of the disease)
5. Why did it occur? (Etiology)
6. What is to be done to reduce the problem? (Control measures)
7. How can it be prevented in future? (Preventive measure)

Epidemiologists discover time, place, person distribution from descriptive study, identify the causes from case-control and cohort studies of various diseases and other health-related events or states and thus this knowledge can be utilized to control the bad or unfavorable condition of health to maintain health at optimum level.

Q22. Uses/Application of epidemiology. *(AKUB, 2022; SSUHSA, 2021, 2023; VKSUAB, 2019; ABKUB, 2023; VBUJH, 2022)*

Ans: **To study historically the rise and fall of disease in the population:** It is well known that health and disease pattern of a community is never constant. There are fluctuations both over short and long period of time. Epidemiology provides a means to study the disease profiles and time trends in human population. By a study of these trends, we can make useful projections into the future and identify emerging health problems and their correlates.

Community diagnosis: Community diagnosis generally refers to the identification and quantification of health problems in a community in terms of mortality and morbidity rates and ratios. By quantification of health problems, we can fix up the priorities in disease control and prevention as well as evaluation of health services.

Planning and evaluation: Epidemiological information about the distribution of health problems over time and place provides the fundamental basis for planning and developing the needed health services and for assessing the impact of these services on people's problems. Evaluation is a concern of epidemiology to find out whether the measures taken are effective in reducing the frequency of the disease.

Evaluation of individual's risks and chances: Epidemiologists calculate the incidence rate and specific rates which are measures of absolute risk also calculate relative risk and attributable risk for a factor related to be the cause of the disease.

Syndrome identification: Epidemiological investigation can be used to define and refine syndromes to correct misconceptions concerning many disease syndromes.

Completing the natural history of disease: It is concerned with the entire spectrum of disease in a population in relation to agent, host and environmental factors in a better position fill up the gaps in the natural history of disease. **Example** an outstanding contribution by epidemiology to the natural history of atherosclerosis is the recognition that one-third to two-thirds of all deaths due to ischemic heart disease are sudden (occurs by less than one hour). This gave tremendous impetus to the development of intensive coronary care unit.

Searching for causes and risk factors: Numerous examples can be cited; epidemiological studies have incriminated that rubella is the cause of congenital defects in the newborn, thalidomide is a teratogenic agent, cigarette smoking is a cause of lung cancer, exposure of premature babies to oxygen is the cause of retrolental fibroplasia, etc.

QM7.3: Enumerate, describe and discuss the sources of epidemiological data.

Q23a. What do you mean by health information system? *(BNMUB, 2002)*

Ans: Health information system composed of several-related subsystems. A comprehensive health information system requires information and indicators on the following subjects:

- Demography and vital events
- Environmental health statistics
- **Health status:** Mortality, morbidity, disability and quality of life
- **Health resources:** Facilities, bed and manpower
- **Utilization and nonutilization of health services:** Attendance, admission, waiting lists
- Indices of outcome of medical care and
- Financial statistics (cost, expenditure) related to the particular objective

Q3b. What are the uses of health information? *(YSRUHSAP, 2023; SDVPC, 2023)*

Ans:
- To measure health status of the people and to quantify their health problems and medical and health care needs.
- For local, national and international comparisons of health status, thus the data need to be standardized.
- For planning, administration and effective management of health services and program.
- For assessing whether health services are accomplishing their objectives in terms of their effectiveness and efficacy.
- For assessing the attitudes and degree of satisfaction of the beneficiaries with health system.
- For research into particular problems of health and disease.

Q3c. What are the various sources of health information available in India? Describe their advantages and disadvantages. *(WBUHS, 2011, 2016, 2018; GNSUB, 2022; AKUB, 2022; BNMUB, 2018, 2023; VKSUAB, 2018; RGUHS, 2010; SSUHSA, 2017, 2022, 2023, 2024; VBUJH, 2022; ABKUB, 2023; VNSGUS, 2023)*

Ans: Health information is required for various purposes. Different sources of health information are described as follows:
- **Census:** A census is defined by the United Nations as 'The total process of collecting, compiling and publishing demographic, economic and social data pertaining at a specified time or times to all person in a country or delimited territory'. The first regular census was taken in 1881 and others took place at 10 years interval. The census is usually conducted at the end of the **first quarter** of the first year in each decade. The reason is claimed that most people are usually resident in their home during this period.
- **Registration of vital events:** These keep a continuous check on demographic changes. Vital events include—live birth, deaths, fetal deaths, marriage, divorces, adoptions, legitimacy, recognitions, annulments, and legal separations. The time limit for registering the events of birth and death is of 21 days.
- **Sample registration system** *(ABKUB, 2018)*: It was initiated in mid-1960s. The SRS is a dual record system, consisting of continuous enumeration of births and deaths by an enumerator and independent survey by an investigator-supervisor. The half yearly survey, in addition to serving as an independent check on the events recorded by the enumerator produces the denominator required for computing rates.
- **Notification of diseases:** Primary purpose of notification is to effect prevention and/or control of disease. Notification is a valuable source of morbidity data, i.e., incidence and distribution of certain specified diseases which are notifiable. At the international level, the following diseases are notifiable to WHO under the international health regulation, i.e., cholera, plague, yellow fever. A few others—louse-borne typhus, relapsing fever, polio, influenza, swine flu, bird flu are subjected to international surveillance.
- **Hospital records:** A study of hospital data provides information on the following aspects—geographic sources of patients, age and sex distribution of different diseases, duration of hospital stay, distribution of diagnosis, association between different diseases and the period between disease and hospital admission, etc.
- **Disease registers:** A register requires a permanent record be established and cases be followed up and the basic statistical tabulations be prepared both on frequency and on survival. Morbidity registers exist for certain diseases and conditions—TB, leprosy, blindness, cancer, etc.
- **Record linkage:** It is used to describe the process of bringing together the records relating to one individual, the record originating in different times or places.
- **Epidemiological surveillance:** This system exists as a part of different disease control/eradication program, such as malaria, kala-azar, polio, measles, etc.
- **Other sources** of health information are:
  - Other health service records
  - Environmental health data
  - Health manpower statistics
  - Population survey.

LM 7.5: Enumerate, define, describe and discuss epidemiological study designs.

Q4. Classify/Categorize the types of epidemiological studies/methods.
(WBUHS, 2016, 2017, 2018, 2023, 2019, 2021; BNMUB, 2013, 2016, 2017, 2018, 2020; ABKUB, 2011, 2015; VKSUAB, 2019; YSRUHSAP, 2020; RGUHS, 2014; TRIU, 2015, 2020, 2023; TDMGRMU, 2012, 2015; KIMS, 2021, 2023, 2024; SAMU, 2011, 2016; BUMP 2008; SMU, 2012, 2015; NU, 2016, 2017; DU, 2004, 2011, 2013; SSUHSA, 2018, 2021; MU, 2019; MUHS, 2019; SDVPG, 2023; MGUB, 2023)

Ans: Classification of epidemiological studies/methods:

Observational study	*Experimental study*
Descriptive study: • **Longitudinal descriptive:** Individuals as unit of study • **Cross-sectional descriptive:** Individuals as unit of study **Analytical studies:** • **Ecological/Co-relational:** Population as unit of study • **Cross-sectional/Prevalence:** Individuals as unit of study • **Case-control/Case-reference:** Individuals as unit of study • **Cohort/Follow up:** Individuals as unit of study	• Randomized controlled trial (where patients as unit of study) • Community trial (where community as unit of study) • Field trial (where healthy people as unit of study)

Q5. Enumerate the steps of procedure in a descriptive epidemiological study.
(WBUHS, 2016, 2018; BNMUB, 2020; TRIU, 2013; SMU, 2009)

Ans: Steps involved in descriptive epidemiological study are:

- **Defining the population:** The first step is to define the population base not only in terms of the total number, but also its composition in terms of age, sex, occupation, cultural characters and similar information needed for study. The defined population can also be especially selected group, such as age and sex group, hospital patients, school children, small communities, etc. Community should be large enough, so that age, sex and other specific rates are meaningful.
- **Defining the disease under study:** Once the population is to be defined or specified, one must define the disease or condition being investigated. The clinician may need a precise definition of disease for immediate patient care. But the epidemiologist, whose main concern is to obtain an accurate estimate of the disease in a population, needs a definition that is both precise and valid to enable him to identify those who have the disease from those who do not. For example, tonsillitis might be defined clinically as an inflammation of tonsils, caused by infection, usually with *Streptococcus pyogenes*, but an operational definition of tonsillitis is presence of enlarged red tonsil with white exudates, which on throat swab culture grow predominantly *Streptococcus pyogenes*.
- **Describing the disease by time, place and person:** The primary objective of the descriptive epidemiology is to describe the occurrence and distribution of disease by time, place and person.
- **Time distribution:** The pattern of disease may be described by the time of its occurrence, i.e., by week, month, year or particular time of the year. Epidemiologists have identified three kinds of time trends or fluctuations in disease occurrence—short-term fluctuation, periodic fluctuations and long-term or secular trends
- **Place distribution:** By studying the geographical distribution of disease, it can be found out that difference in disease pattern persists not only between countries, but also within countries. In short, geographical studies have profoundly influenced our understanding of disease, its nature, its detriments and its relation to subsequent pathology. The geographical variation may be classified as—international variation, national variations, rural urban differences, and local distribution.
- **Person distribution:** In descriptive studies, the disease is further characterized by defining the persons who develop the disease by age, sex, ethnicity, occupation, marital status, social class, habit, behavior, etc.

- **Measurement of disease:** The information should be available in terms of mortality, morbidity, disability and so on, and should preferably be available for different subgroups of the population. Morbidity has two aspects—incidence and prevalence.
- **Comparing with known indices:** The essence of epidemiology is to ask questions and make comparisons. By making comparisons between different populations and subgroups of the same population, it is possible to arrive at clues of disease etiology.

Uses of descriptive epidemiology *(ABKUB, 2021)*

Formulation of hypothesis: An epidemiological hypothesis should specify the following:

- **The population:** The characteristics of the persons to whom the disease applies.
- **The specific cause** of the disease should be considered.
- The expected **outcome** of the disease might be explored and narrated.
- **The dose-response relationship:** The amount of the cause needed to lead a stated incidence of the effect can be hypothesized.
- **The time-response relationship:** The time period that will elapse between exposure to the cause and observation of the effect can be brought out by this kind of study.

Q6. The salient features of different types of time trends in disease occurrence with suitable examples. What are the different possible changes over time that you should keep in mind while interpreting time trends.

(WBUHS, 2014, 2017; ABKUB, 2006; TRIU, 2016; TDMGRMU, 2009, 2011; SSUHSA, 2008; RUJH, 2024)

Ans: The pattern of disease may be described by the time of its occurrence, i.e., by week, month, year, the day of the week, hour of onset, atmospheric temperature, climate, etc. This study often gives a clue about the etiology of the disease or predisposing factors of the disease, so that preventive measures can be adopted.

A. Time distribution

There are three kinds of time trends or fluctuations:

Short-term fluctuations: This means sudden occurrence of a disease in a given area and lasting for a short period of time. Example: An epidemic disease, such as dengue.

Mention the different types of epidemics with suitable examples and illustrations.

(WBUHS, 2012, 2016; BNMUB, 2004, 2012; RGUHS, 2010; BUMP, 2009, 2016; DU, 2016; TRIU, 2012, 2023; KLMS, 2021; SSUHSA, 2013, 2017; GOAU, 2022, 2023; ABKUB, 2023; VNSGUS, 2023)

Different types of epidemics are mentioned below:

There are **three types** of epidemics.

1. Common source epidemics
2. Propagated epidemics
3. Slow (modern) epidemics

Common source epidemics: This is an epidemic occurring from a common source, either by single exposure or by repeated exposure.

The common source single exposure epidemics (Point source epidemic): This means that all cases develop almost simultaneously following single exposure. Example: Food poisoning, Bhopal Gas tragedy, etc.

Common source repeated/continuous exposure epidemic: In this type, epidemic disease occurs from a common source, but the exposure occurs continuously or intermittently or repeatedly and not necessarily simultaneously. So, epidemic is not explosive. For example, a commercial sex worker as a source of gonorrhea, infecting all her clients over a period of time. There is sudden rise and gradual fall of the curve.

Propagated epidemic: The epidemic does not originate from a common source, such as food or water but spreads from person-to-person until all the susceptible persons are affected. There is gradual rise and gradual fall of the curve. Examples: Epidemics of meningitis and measles.

Modern or slow epidemic: This epidemic referred to noncommunicable diseases, e.g., cancer, hypertension, diabetes mellitus. These diseases are increasing in number because of change of lifestyle and quality of life.

Periodic fluctuation: Periodic fluctuation is occurrence of a disease during definite period in a season or in cyclic trend. Measles occurs every few years and this is one of good example of periodic fluctuation.

Seasonal trend: Measles and chickenpox occur in spring season. Upper respiratory infection is seen in the winter season. Diarrheal diseases occur during summer.

Cyclic trend/Epidemiological features of cyclic trend in disease occurrence with examples *(WBUHS, 2021)* Epidemic of measles once in 2 to 3 years, Rubella occurs in 6 to 9 years, influenza once in 7 to 10 years, occurring due to **variations in herd immunity**. Accidents are seen more on the weekend (Saturdays). The knowledge of cyclicity of disease is useful to defend the communities.

Long-term fluctuations or secular trends/Epidemiological features of secular trend in disease occurrence with examples *(WBUHS, 2021)*

It implies changes in occurrence of disease, i.e., progressive increase or decrease over a long period of time generally several years of decades. It also reveals a consistent tendency to change in a particular direction or definite movement in one direction. Examples, the coronary heart disease, diabetes, lung cancer have upward trends in developed countries during last 50 years followed by downward trend of leprosy, tuberculosis, typhoid fever and diphtheria, etc.

Interpretation of time-trends: The study of time distribution of a disease helps the epidemiologists not only for formulation of epidemiological hypothesis but also to implement prevention and control of disease.

Q6a. Changing concept of epidemic. *(ABKUB, 2023)*

Ans: The epidemiologic transition describes changing patterns of population distributions in relation to changing patterns of mortality, fertility, life expectancy, and leading causes of death. The perspective has its origins in demography, but finds a compatible conceptual home in public health and epidemiology in particular.

The very term "epidemiologic transition" raises the question of transition from what to what? There are two major components of the transition: (1) changes in population growth trajectories and composition, especially in the age distribution from younger to older and (2) changes in patterns of mortality, including increasing life expectancy and reordering of the relative importance of different causes of death.

Development, testing, and implementation of innovative approaches to reduce the risks associated with the sedentary lifestyle and hypernutrition in developed countries should not overshadow the continuing threat from infectious diseases, especially resistant strains or newly encountered agents. Interventions must fit populations and the threats to health they experience, while anticipating changes that will emerge with success in some areas. This will require new ways of thinking that go beyond the epidemiologic transition theory.

B. **Place distribution:** The pattern of occurrence of a disease in different places. This helps to compare the disease occurrence from one country to another country and within the same country from one state to another state, from rural to urban areas and local areas.

International variations: For example, cancer of stomach is common in Japan, unusual in USA. Ca cervix common in India, less in UK, USA, etc. Breast cancer low in Japan, high in Western countries, etc. This help the epidemiologist to identify the causative factors and thereby prevention.

National variations: For example, goiter is more in sub-Himalayan region, lathyrism in Madhya Pradesh, filarial in coastal areas, etc. Thus, diseases show variations within the same country. This also helps the epidemiologist to find out favorable factors for the disease, thereby appropriate healthcare services can be provided.

Rural-Urban variations: The prevalence of noncommunicable diseases, such as diabetes, hypertension, cancer, and mental diseases are more in urban areas than rural areas. Zoonotic diseases are more common in rural areas. These variations help the epidemiologist to identify the risks factors and risk groups and thereby appropriate care can be taken.

Q6b. Local distribution of disease (spot map). *(RGUHS, 2002, 2013; SAMU, 2015)*

Ans: Local area map representing the number of cases in the locality in the form of spots depending upon the residency status. This is called geographic spot map. Such a map shows at a glance, area of high and low frequency. Area of high frequency gives clue about the common source of infection. A study conducted by John Snow of England in 1954 focused attention on a common water pump in Broad street of London was the source of infection of cholera epidemic. Thus, was also able to hypothesize that cholera was a water-borne disease, that time causative organism for cholera not been identified **(Fig. 7.1)**.

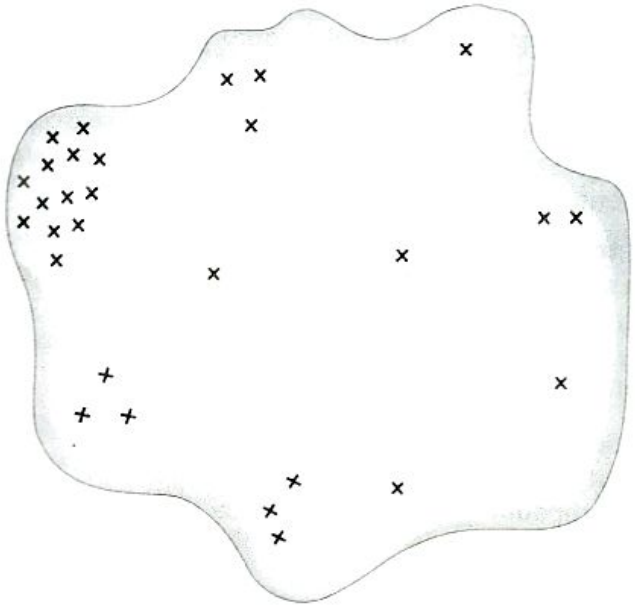


Fig. 7.1: Spot map.

Thus, geographic spot map helps the epidemiologist to know the source of infection and also mode of spread, thereby etiological hypothesis could be formulated.

C. **Person distribution:** The distribution of disease in the community depends upon characteristics of person affected, such as age, sex, marital status, occupation, social class, behavior, stress and migration.

Characteristics of person	*Distribution of diseases*
Age	Age of individual is strongly related to the disease. **Example:** Measles and diphtheria among preschool children, cancer in middle age and atherosclerosis in elderly. But there are certain diseases, such as Hodgkin's disease and leukemia which have increased incidence in two age groups. Hodgkin's disease is more between 15 to 35 years and between 70 to 90 years. Such tendency of disease is called "Bimodality phenomenon". Again, tuberculosis has "Trimodality distribution"—a small peak in early childhood, an extensive peak in adult age and a moderate peak in old age.
Gender	Certain diseases are more common among men. **Example:** Lung cancer, tuberculosis and coronary heart disease are more common in males and obesity common in females than males. In some population sub-groups occurrence of disease due to different racial and ethnic origin. **Example:** TB, cancer and sickle cell anemia.

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Characteristics of person	Distribution of diseases
Marital status	Cancer cervix rare in nuns compared to married women. So mortality rate is high in married women. Again cancer cervix is associated with multiple sexual contacts and promiscuity which may led to sexually transmitted infections (STI).
Occupation	Occupation plays important role for causation of disease. The agriculture workers more porn to develop tetanus, snake bite, trauma, ankylostomiasis. Workers in dust industry suffered from pneumoconioses, silicosis. But sedentary workers face the risk of heart disease.
Social class	Disease, such as hypertension, diabetes, coronary heart diseases are common among people of higher socioeconomic class and diseases, such as malnutrition, rheumatic heart diseases and communicable diseases are common among people of lower socioeconomic class. Thus, social factors, such as poverty, illiteracy, ignorance, poor standard of living, overcrowding, etc., play a very important role in development of diseases in the community. Since, the social classifications vary from one country to another country, it is difficult to compare results.
Behavior	Human behavior or lifestyle such as smoking, alcoholism, drug-abuse and multiple sexual partners, etc., influence the development of the diseases. Thus, study of these risk factors help the epidemiologist to formulate an etiological hypothesis.
Stress	Stress increases the susceptibility of an individual to the disease and often exacerbates the symptoms.
Migration	Migration of people from rural to urban areas has resulted in spread of diseases from one place to another. Migration of the people is a challenge for the prevention and control of disease.

Q7. Difference between cross-sectional and longitudinal study. *(SAMU, 2011; BNMUB, 2018)*

Ans:

Cross-sectional study	Longitudinal study
A single observation of a cross-section of a population at one point of time	Repeated observation in the same population over a prolonged period of time by means of follow-up examination
It is also called prevalence study	It is also called incidence study
It is linked a still photograph	It is linked to cine film or video
More useful for chronic diseases, such as diabetes mellitus, hypertension	Useful for short lived diseases, such as diarrheal diseases, ARI, etc.
Less time consuming	More time consuming
Easy to organize	Difficult to organize
It gives very little information about natural history of disease or rate of occurrence of new cases	Provides information about natural history of disease and its future outcome
Concept of causality cannot be deduced but distribution patterns may suggest causal hypothesis	Identify risk factors of disease

Q8. Give a step-by-step description of how to conduct a descriptive cross-sectional study to assess the extent of overweight and obesity among medical students of your institution. *(WBUHS, 2019)*

Ans: A descriptive cross-sectional study to assess the extent of overweight and obesity among medical students of our institution can be done within a short period of time.

It is really the best option, i.e., descriptive cross-sectional study in order to assess the extent of overweight and obesity among medical students and time required will be less. The steps will be as follows:

- **Definition of the problem (disease):** Problem is prevalence of **overweight and obesity** among medical students. **Overweight and obesity** will be measured by me and my co-investigator. Pre-final and final year students will be the study population (200) both male and female. Total enumeration methods will be applied with a total of 200 students. This number of students can be assessed by two investigators. Standard operating procedure will be followed in each and every student. Here the students are mostly

adult and Body Mass Index (BMI) will be measured. BMI is the ratio of weight in kg and height in meter square. Normal BMI is <25. BMI from 25 to <30 is considered overweight and BMI ≥30 is considered obese. The study population will be using above criteria.

- **Defining the population of the community:** The study population will be briefed about the study, their consent also taken before data collection. The information gathered, such as age, sex, food habit, weight, height, exercise history, place of origin, co-morbidities, etc., and this information will be utilized during data analysis.
- **Describing the distribution of the disease in relation to time, place and person:** Here overweight and obesity is the problem. Time distribution cannot be measured because the study will be cross-sectional in nature and this type of study cannot provide time distribution. Residence of the students will be considered in this study and thus place distribution can be identified. Age, sex, food habit, height, weight, etc., are few variables of this study and hence person variety can be utilized to describe distribution in relation to person.
- **Measurement of the disease:** Overweight and obesity will be identified examining participants afterwards, their proportion can be easily measured from denominator 200.
- **Making comparison with known indices:** Overweight and obesity are identifiable problems of any society of some sex, age, location, etc., if this is tried in that society. As overweight and obesity are common problems and it is measured easily. Data on such problem are readily available. The overweight and obesity problems of our students can be compared with such known society and higher or lower proportion of problems can be declared among our students.
- **Formulation hypothesis:** At the end of our study, we shall be able to formulate hypothesis which may generalize cause-effect relation among our students of our college.

  In this way, prevalence of overweight and obesity among students of our college may be achieved within a short period of time through a cross-sectional study.

Q9. Describe in brief the steps in conducting a case-control study with an appropriate example.

(WBUHS, 2016, 2017, 2018; BNMUB, 2016, 2017, 2018; MGUB, 2022; ABKUB, 2011, 2015; GITAMAP, 2023; RGUHS, 2014, 2024; TRIU, 2013, 2015; PBDSUHSH, 2018; TDMGRMU, 2012, 2015; KIMS, 2021; SAMU, 2011, 2016; BUMP, 2008; SMU, 2012, 2015; NU, 2016, 2017; DU, 2011, 2013; SSUHSA, 2018; MU, 2019; MUHS, 2019; SDVPG, 2023; DBRAUA, 2024)

Ans: Definition of case-control study: Case-control study is retrospective in nature considering the time-frame where cases (group of diagnosed patients) and controls (group of matched persons without diseases) are compared in relation to factors which are predominantly present with the patients. Thus, associated factors can be identified among patients and this association can be statistically proved. So, the cause (factor) can be assumed from the effect (patients).

The following steps are involved in case-control study:

A. **Selection of cases and controls:**

- **Selection of cases**: Two criteria must be kept in mind during selection of cases from hospitals or community, i.e., diagnostic criteria and eligibility criteria.
- **Diagnostic criteria:** This must be specified before the study is undertaken. For the diagnosis of lung cancer, histological findings should be same for all cases. Once the diagnostic criteria are established, they should not be changed or altered till the study is over.
- **Eligibility criteria:** Usually criterion is newly diagnostic cases within a specified period of time but not the old and advanced cases. Eligibility for selection of cases is prefixed and this is followed throughout the study.
- **Sources of cases:** The cases may be selected from the hospitals or from the community.
- **Size of the cases:** The size of the sample of cases is estimated by the particular formula and selection is done by particular sampling method.
- **Selection of controls:** The control groups should have all the features as those of cases, except that they do not have the disease under study.

- **Sources:** They are drawn from the sources, such as hospitals, relatives, neighbors or general population. Control groups can also be selected from the same locality or from the same industry or from the same school as that of cases.
- **Size of the controls:** The size of controls depends upon the size of cases. If the size of cases is small (say <50), then the size of the controls should be double, triple or four times that of cases.
- **Matching:** It is the process of selection of control in such a way that not only they resemble cases (study group) in all the variables and free from the disease under study but also free from the confounding factor.

B. **Measurement of exposure**: This consists of collection of data from both the cases and the control groups about their exposure to case with reference to duration and frequency of exposure. Such information can be obtained either by questionnaire, interview, etc.

C. **Analysis and interpretation:** The data are analyzed to find out whether any association exists between the disease and suspected factors. To know the existence of relation between the disease and the suspected factors, exposure rate has to be estimated in both the groups and compared. If the exposure rate among the cases is seen greater than of control, which means, there may be existence of the association between the disease and suspected factor, (i.e., lung cancer and smoking). To know the strength of association between the disease and the suspected factor **Odds ratio (cross-product ratio)** has to be calculated.

D. **Interpretation:** Higher is the value of Odds ratio; greater is the strength of association between the disease and suspected factor.

Q10. Describe the steps of case-control study to find out the association between smoking and lung cancer. *(WBUHS, 2023; DU, 2016; RUJH, 2013; AKUB, 2024)*

Ans: The steps of case-control study to find out the association between smoking and lung cancer are given below and these steps should be followed to fulfill our study objectives. Smoking and lung cancer are highly related and this relation or association can be found out by case-control study.

Selection of cases:

- **Diagnostic criteria:** The cases should be identified through application of uniform criteria. Lung cancer patient will be selected from the chest department. Diagnostic criteria will be cytology suggesting cancer in lung.
- **Eligibility criteria:** All the patients of lung cancer will be taken as cases. The patients who are critically-ill and unable to respond and are declining from the study getting information from investigators may be exempted.
- **Size:** The number of cancer lungs will not be huge. All the cases during the study period will be taken in the study except excluded patients. It can be said that the number will be around 50 in three months in our hospital.
- **Sources:** It is clear from the discussion that hospital admitted patients will be our cases.

Selection of controls:

- **Size and sources:** The number of controls will be 3–4 times of the cases. These controls may be the patients admitted in the same department with proper matching.
- **Matching:** Matching of cases and controls is required to eliminate related variables, such as age, sex, occupation, etc. Procedure may be either group matching or paired matching. Confounding factors also should be considered for elicitation of correct results from the study. Matching is an important issue to eliminate the biases.

Measurement of exposure among both the cases and controls:

- **Exposure rate to suspected factor in both the groups:** The suspected factors for causation of cancer of the cases and controls will be analyzed to estimate their presence in both the groups. This can be exposure rate to those suspected factors.

- **Duration of exposure:** Exposure duration may be related with the disease. More time may be related with more exposure and it may relate with the outcome.
- **Frequency of exposure:** Similar period of exposure may be different depending upon the dose of exposure and that also can be calculated.
- **Analysis: Assessment of association between exposure and outcome**—measurement of exposure rate will tell the association between suspected factors and outcome.
- **Strength of association: Odds ratio** can be calculated from 2 X 2 contingency table and that will help us to conclude its association strength.

Q11. Describe in brief about cohort study including types and steps of it. *(WBUHS, 2008; MGUB, 2022; BNMUB, 2012, 2014, 2015; ABKUB, 2006, 2018, 2023; YSRUHSAP, 2020; RGUHS, 2009, 2014; SMU, 2012; BUMP, 2012; SAMU, 2011; TDMGRMU, 2010, 2011; SSUHSA, 2012; RUJH, 2011; MU, 2019, 2022; TRIU, 2023; GOAU, 2021; SDVPG, 2023)*

Or

Cohort studies are not always prospective studies—Explain. *(WBUHS, 2015; MGUB, 2024)*

Ans: Cohort study: This is a type of analytical study undertaken to support or reject the association between the suspected factor(s) and outcome among any population. **"Cohort" is a group of persons possessing common characteristics within a defined time period.** It is done on "Cohort" that is why, it is called cohort study.

Examples: Those born during a particular time period constitute **"Birth cohort"**
Those married during a particular time period constitute **"Marriage cohort"**
Those exposed to common drugs or vaccines or risk factors constitute **"Exposure cohort"**

There are 3 types of cohort studies:

1. **Prospective cohort study**: It is the most common and most scientific method of cohort study. It begins at the present time and continues in future and then terminates. It is also called "current cohort study". In this type, the exposure and study outcome start simultaneously.
2. **Retrospective cohort study or historical cohort study:** In this type, the investigator goes back about 15 to 20 years and selects the study group from existing records. Keeping in mind, the exposure had occurred in past but the disease outcome) not occurred and traced forward up to the present time for occurrence of the outcome (disease). It is also called "Non-Current Prospective study". These studies are not only economical but also produced results more quickly than prospective cohort study.
3. **Combination of retrospective and prospective cohort studies:** In this study, Cohort and control groups are identical from the past records and followed up prospectively up to present time and continued to follow up in future.

Q12. Indications for cohort studies. *(WBUHS, 2008; BNMUB, 2002; RGUHS, 2009, 2014; SMU, 2012; BUMP, 2012; SAMU, 2011; TDMGRMU, 2010; SSUHSA, 2012)*

Ans: Indications for cohort studies are discussed below:

- When there is good evidence of an association between exposure and disease, as derived from clinical observation and also supported by descriptive and case-control studies.
- When exposure is rare but incidence of disease is higher among exposed, e.g., special exposure groups such as those in industries, exposure to X-ray.
- When attrition of study population can be minimized, e.g., follow up is easy, cohort is stable, cooperative and easily accessible and lastly
- When adequate funds are available.

Flowcharts of cohort studies:

Prospective study: Study starts _____ Exposure _____ Disease
Retrospective study: Exposure _____ Study starts _____ Disease
Retroprospective study: Exposure _____ Disease _____ Study starts

From the above statement, we come to a conclusion that Cohort studies are not always the only prospective studies as retrospective study and combination of prospective and retrospective studies are also parts of cohort studies.

Study design or framework of a cohort study: This study involves two groups of people. One group is called study cohort or exposure cohort, who share common characteristics, such as age, sex, occupation, income, literacy and marital status, etc., and they are exposed to suspected etiological factor and another group called control cohort who possess the same variable as study cohort but are not exposed to particular factor. Both the groups are followed up over a period of time under same identical conditions and estimate the incidence (Frequency) of disease in both groups and compared.

Different steps (Elements) of a cohort study:

A. Selection of study cohort
B. Selection of control cohort
C. Follow up
D. Analysis

Selection of study cohort or exposure cohort: The estimated sample size usually large in number having common characteristics is obtained from general population as birth cohort, marriage cohort, exposure cohort, etc., or from special homogenous group of population, such as doctors, lawyers, nurses, industrial workers, etc. They are easily accessible, easy for follow up.

Selection of control cohort or unexposure cohort: This group is selected from the reference population. Reference population is one to which the results are applicable. All of them have the common characteristics, such as age, sex, occupation literacy level, socioeconomic status, etc., but not exposed to risk factors.

Examples of study cohort and control cohorts are given below: Smoker versus non-smokers as study cohort and control cohorts are taken to study effect of smoking. Radiologist versus ophthalmologists as study cohort and control cohorts are taken to study the radiation hazards.

Follow up: It consists of periodic medical examination or doing special tests or reviewing the records for occurrence of disease (outcome) in both groups and thereby measurement of frequency of disease. However, death or migration or withdrawal of certain volunteers may lose some percentage of study or control population. At the beginning of the study, both the groups are healthy. They are followed up for a period as per the hypothesis, at the end of which the number of cases (disease) occurring in both the groups is noted.

Analysis: The collected information is analyzed to find out whether any association exists between the suspected factor and disease under study. If yes, the strength of association should be calculated. To know the association between suspected factor and disease under study, incidence rate (frequency of disease) has to be determined in both the groups and compared.

If incidence in exposed group is greater than that of un-exposed persons, then it suggests the existence of association between suspected factor (smoking) and disease (lung cancer).

To study the strength of association, the following indicators, such as relative risk, risk difference, attributable risk and population attributable risk, etc., should be calculate.

Q13. Mention briefly the important differences between case-control and cohort study.
(WBUHS, 2019, 2022; AFUH, 2022; BNMUB, 2017, 2020, 2022; ABKUB, 2022; PBDSUHSH, 2013, 2015; SMU, 2011, 2013; SSUHSA, 2022; RGUHS, 2011; NU, 2017; MU, 2019; RUJH, 2023, 2024; AKUB, 2023)

Ans: Important differences between case-control and cohort study are mentioned below:

Case-control study	*Cohort study*
It proceeds backward from effect to cause	It proceeds forward from cause to effect
It requires relatively few subjects	It requires large number of study subjects

Contd...

Contd...

Case-control study	Cohort study
It is less expensive	It is more expensive
This is suitable for study of rare disease	This is not suitable for study of rare disease
Attrition problems are minimal, because it does not require follow up	Attrition problems are present, because it requires follow up
Incidence rate cannot be calculated	Incidence rate can be calculated
Temporal association cannot be ascertained	Temporal association can be ascertained
Tests whether the suspected cause occurs more frequently in those with disease among those without the disease	Tests whether disease occurs more frequently in those exposed than those not similarly exposed
Cannot yield information about disease other than selected for study	Can yield information about more than one disease outcome
Yields are relatively quicker results	Yields are relatively delayed results

Q14. Explain briefly the merits/strength/advantage and demerits/weakness/disadvantage of case-control and cohort study designs. *(WBUHS, 2010; MGUB, 2022; BNMUB, 2012, 2014; ABKUB, 2006; TRIU, 2021, 2023; DU, 2011; RGUHS, 2014; TDMGRMU, 2008, 2013; SSUHSA, 2009, 2012; NU, 2015, 2016. SDVPG, 2023)*

Ans:

Advantages of case-control study	Disadvantage of case-control study
It is relatively easy to carry out.	Selection of appropriate control group may be difficult.
It requires comparatively few subjects.	Temporal relationship cannot be ascertained.
This is less time consuming	Incidence rate cannot be calculated, it can only measure odds ratio
The study is less expensive.	Not suited to the evaluation of therapy or prophylaxis of disease.
Multiple risk factors can be identified.	This type of study is subjected to biases, such as confounding bias, recall bias, interviewer's bias, Berkson's bias, etc.
No attrition problem, because it does not require follow up.	
Ethical problems are minimal.	
No risk to the subjects is existent.	
The study is particularly suitable for investigation of rare diseases.	
Rational prevention and control program can be established on the basis of the results obtained in case-control study.	

Advantages of cohort study	Disadvantages of cohort study
Incidence rate and relative risk can be calculated	It requires large number of study subjects.
Temporal association can be ascertained.	Cohort study is time consuming.
Multiple outcomes related to exposure can be calculated.	This is comparatively costly affair.
Dose-response ratio can be calculated.	This is not suitable for investigation of rare diseases
Since the comparison groups are formed before the disease develops, certain form of bias can be minimized, such as misclassification of individual into exposed and non-exposed groups.	Certain administrative problems, such as loss of funding, loss of experienced staff, extensive record keeping are inevitable.
	As it is time consuming, it can lose their original cohort, some may migrate, and some lose interest or simply refuse to provide relevant information.
	Participants of cohort study may change their behavior during follow up.
	Cohort study is faced with ethical problems.

Enumerate different types of analytical studies. Describe basic steps of randomized control trial (RCT). *(MGUB, 2022; 2023; BNMUB, 2013, 2016; GITAMAP, 2023; RHUHS, 2015, SAMU, 2007; SSUHSA, 2013, 2022; 2023; TDMGRMU, 2009; ABKUB, 2005, 2015; BUMP, 2012; DU, 2011; NU, 2016, 2017; KIMS, 2017, 2023, 2024; RUJH, 2012, 2013, 2023; SDVPG, 2023; VBUJH, 2023; GOAU, 2022)*

Randomization is the heart of control trial. *(AKUB, 2022; KIMS, 2019)*

Ans: **Types of analytical studies:**

a. Case-control study
b. Cohort study
c. Ecological study and
d. Cross-sectional study

Basic steps of randomized control trial are:

A. **Drawing up a protocol:** The protocol specifies the following: (a) Aims and objectives of the study, (b) Questions to be answered, (c) Criteria for the selection of study and control groups, (d) Sample size, (e) The procedures for allocation of subjects into study and control groups, (f) Treatment to be applied—when and where and how to what kind of patients, (g) Responsibilities of the parties involved in trial. Once a protocol has been evolved, it should be strictly adhered to throughout the study. The protocol aims at preventing bias and to reduce the sources of error in the study.

B. **Selecting the reference and experimental population:**

- *Reference or target population:* A reference population may be as broad as mankind or it may be geographically limited or limited to persons in specific age, sex, occupational or social group. Thus, the reference population may comprise the population of a whole city or a population of school children, industrial workers, etc.
- *Experimental or study population:* The study population is derived from the reference population, and it is the actual population that participates in experimental study. Ideally, it should be chosen from the reference population, so that it has the same characteristics as the reference population. When an experimental population has been defined, its members are invited to participate in the study. It is important to choose a stable population whose cooperation is assured to avoid losses to follow up. The participants or volunteers must fulfill the following three criteria.
  1. They must give informed consent, i.e., they must agree to participate in the trial after having been fully informed about the purpose, procedures and possible dangers of the trial.
  2. They should be representative of the population to which they belong to.
  3. They should be qualified or eligible for the trial. If we are testing the effectiveness of a new drug for the treatment of anemia, if the volunteers are not anemic, they are not eligible or qualified for trial.

C. **Randomization:** It is a statistical procedure, by which the participants are allocated into groups usually called study group and control group, to receive or not to receive an experimental preventive or therapeutic procedure or intervention. Randomization is an attempt to eliminate bias and allow for comparability.
Randomization is the heart of clinical trial: It will give the greater confidence that the groups are comparable. It ensures that investigator has no control over allocation of participants to either study or control group, thus eliminating known as selection bias.

D. **Manipulation or intervention:** Having formed the study group or control group, the next step is to intervene or manipulate the study group by the deliberate application or withdrawal or reduction of the suspected causal factors as laid down the protocol. This manipulation creates an independent variable (e.g., drug, vaccines, new procedure, etc.), whose effect is then determined by measurement of the final outcome, which constitutes the dependent, variable (incidence of the disease, survival time, recovery period, etc.).

E. **Follow up:** This implies examination of the experimental or control group subjects at defined intervals of time, in a standard manner, with equal intensity, till the final assessment of outcome. The duration of the trial usually based on expectation that a significant difference will be demonstrable at a given point of time after the start of the trial. Thus, the follow up may be short or may require many years depending on the study undertaken.

F. **Assessment of outcome:** The final step is assessment of the outcome of the trial in terms of:
- *Positive results:* Such as benefits of the experimental measures, such as reduced incidence or severity of the disease, cost of the health services or other appropriate outcome in the study and control groups.
- *Negative results:* Severity, frequency of side effects and complications, if any, including death. The incidence of positive/negative results are rigorously compared in both the groups and the differences, if any, are tested for statistical significance.

Q16. Blinding in epidemiological studies (RCT). *(WBUHS, 2016; VKSUAB, 2016; RGUHS, 2013; KIMS, 2016; DU, 2006; RUJH, 2023; MGUB, 2023; VBUJH, 2023)*

Ans: Blinding in epidemiological studies (RCT): Blinding technique is applied in randomized controlled trials to overcome the errors and bias. The level-wise investigators may remain blind about the facts taken in the study.

Types of blinding: Single blind, double blind and triple blind.

Single blind trial	*Double blind trial*	*Triple blind trial*
• Participants not aware whether he belongs to study or control groups • But investigator knows who belongs to which group • It helps to overcome subject variation	• Neither the participants nor the grass-root level investigators are aware about the groups allocation and treatment administered however statistician knows the group allocation • It avoids both observer and subject bias • Participants and drugs are coded • Most frequently used method and scientifically sound also	• Participants, investigator and statistician are blind • Most ideal but not frequently used method

CM7.8: Describe the principles of association, causation in epidemiological studies.

Q17. Causation in epidemiological studies. *(VKSUAB, 2018; RUJH, 2023; GOAU, 2022)*

Ans: Principles of association: Descriptive studies help identify disease problem (estimate) in the community also suggest an etiological hypothesis. On the other hand, analytical and experimental studies test the hypothesis (determine) derived from descriptive studies and also confirm or refute the observed association between suspected causes and disease.

The terms association and relationship are often used interchangeably. Association may be defined as the concurrence of two variables more often than would be expected by chance. Association does not necessarily imply a causal relationship.

Association can be broadly grouped as follows:
- Spurious association
- Indirect association
- **Direct association:**
  - One to one causal association
  - Multifactorial causation

Spurious association: Sometimes an observed association between a disease and suspected factor may not be real. For example, a study in UK of 5174 births at home and 11,156 births in hospitals showed a perinatal mortality rate of 5.4 per 1000 in home births and 27.8 per 1000 in hospital births. Apparently, the perinatal mortality was higher in hospital births than in home births. It might be concluded that homes are a safer place for delivery of births than hospitals. **Such conclusion is spurious.**

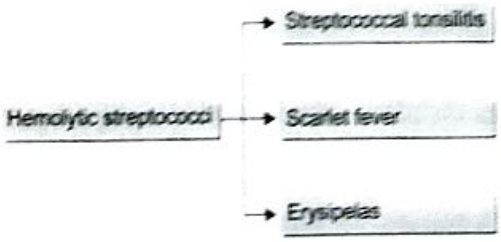
In general, hospital attract women at high risk, for delivery because of their special equipment and expertise, whereas this not true with home deliveries. There might be other factors, such as difference in age, parity, prenatal care, home circumstances and general health condition, etc., that makes the difference.

Indirect association: It is a statistical association between a characteristic (or variable) of interest and a disease due to the presence of another factor, known or unknown, that is common to both the characteristic and the disease. This third factor (common factor) is also known as the *confounding variable*.

Example:
Altitude and endemic goiter: Endemic goiter is generally found in high altitudes, showing an association between altitude and endemic goiter. We know that endemic goiter is not due to altitude but due to environmental deficiency of iodine. A common factor (iodine deficiency) can result in an apparent association between two variables, when no association exists. This amplifies the earlier statement that statistical association does not necessarily mean causation.

Direct (causal) association:

- **One to one causal relationship:**
  Two variables are stated to be causally related (AB) if change in A is followed by change in B, if it does not, then their relationship cannot be causal. This is known as one-to-one causal relationship. When the disease is present, the factor must be present.
  Example, measles: Epidemiologists are interested in identifying the cause. The most satisfactory procedure to demonstrate this would be by direct experiment. The above concept of one-to-one causal relationship was the essence of Koch's postulates. Whenever the disease occurs, the factor or cause must be present. Although Koch's postulates are theoretically sound, the necessary and sufficient concept does not fit for many diseases. **Example,** tubercle bacilli cannot be found in all cases of the disease but this does not rule out the statement that tubercle bacilli are the cause of tuberculosis. Thus, cause must be sufficient is also not always supported by evidence. It is also well-known that besides tubercle bacilli, there are additional factors, such as host susceptibility which are required to produce the disease.
  The concept of one-to-one causal relationship is further explained that sometimes, a single cause or factor may lead to more than one outcome.



- **Multifactorial causation:** The cause is different when we consider a noncommunicable disease or condition (e.g., CHD) where the etiology is multifactorial. The following model is presented to explain the situation. In **Figure 7.2**, there are alternate causal factors (factors 1, 2 and 3) each acting independently. This situation is explained in lung cancer where more than one etiological factor (e.g., smoking, air pollution, exposure to asbestos) can produce the disease independently. As our knowledge of cancer increases, we may discover a common biochemical event at the cellular level that can be produced by each of the factors. The cellular or molecular factor will be considered as a causal factor.

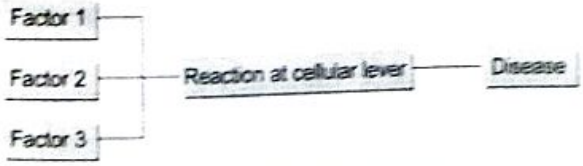


Fig. 7.2: Multifactorial causation.

Additional criteria for judging causality:

- Temporal association
- Strength of association

- Specificity of association
- Consistency of association
- Biological plausibility
- Coherence of association

Q18. Temporal association between risk factors and disease. *(SMU, 2013)*

Ans: It is a criteria-based association between risk factors and disease. One question is very important for judging causality in a temporal association.

Does the suspected cause precede the observed effect?

A causal association requires that exposure to a putative cause must precede temporally the onset of a disease which is allowed for a necessary period of induction and latency. **This is a basic requirement for causal concept.**

In certain acute diseases, such as water and food-borne outbreaks, discovery of temporal sequence of two variables (e.g., drinking contaminated water and diarrhea) is often a serious problem. Again, in many chronic diseases, because of insidious onset and ignorance of precise induction periods, it becomes hard to establish a temporal sequence as to which come fast—the suspected agent or the disease, as one is dealing with a continuous evolving process.

Association of lung cancer and long-standing smokers satisfy the criteria of temporal association. Further, the increase consumption of cigarettes preceded by about 30 years, cause increase death rates from lung cancer. These observations are compatible with characteristic long latent period of carcinogenesis.

Strength of Association *(ABKUB, 2023)*

The strength of association is based on answers to two questions:

a. Relative risk—is it large?

b. Is there a dose-response, duration-response relationship?

Larger the relative risk, greater the likelihood of a causal association.

If there is no dose-response, duration—response relationship, that would be an argument against the relation being causal. The causal relationship of cigarette smoking and lung cancer has been based on three points—(a) Relative risk, (b) Dose-response relationship, and (c) Decrease in risk on cessation of smoking.

Dose-response relationship is found in epidemiological studies, such as smoking and lung cancer. Again, cessation experiment against death rate having a relation. Mortality ratios were reduced in ex-smokers by number of years stopped smoking.

Specificity of association: The concept of specificity implies a one-to-one relationship between the cause and effect. Cigarette smoking is linked with not only lung cancer but several others disease, such as CHD, bronchitis, emphysema, cancer cervix, etc. It is true that cigarette smoking is associated with so many diseases reflecting an apparent lack of specificity, but that cannot be a strong argument to dismiss the causal hypothesis. Requirement of specificity is a most difficult criterion to establish not only in chronic disease but also in acute diseases and conditions. The reasons are: (a) A single cause or factor can give rise to more than one disease, (b) Most diseases are due to multiple factors with no possibility of demonstrating one-to-one relationship.

The concept of specificity cannot be entirely dissociated from the concept of association. About 80–90% of lung cancer can be attributed to cigarette smoking. Under the heading of specificity, two more observations are: (a) Not everyone who smokes develops cancer, and (b) Not everyone who develops lung cancer has smoked.

Answer of group "a" is multifactorial nature of lung cancer. Answer of group "b" is as per lung cancer in non-smokers, there are other factors apart from smoking, such as occupational exposure to chromates, asbestos, nickel, uranium and exposure to air pollution.

Deviations from one-to-one relationship between cigarette smoking and lung cancer, therefore, cannot be said to rule out a causal relationship.

Consistency of association: The association is consistent if the result is replicated when studied in different settings and by different methods. Thus, evidence from a single study is seldom sufficient to establish causal association. If there is no consistency, it will weaken causal interpretation.

A consistent association has been found between cigarette smoking and lung cancer. More than 50 different retrospective studies and at least nine prospective studies in different countries had shown a consistent association between cigarette smoking and subsequent development of lung cancer, which is in support of causal association.

Biological plausibility: Causal association is supported if there is a biological credibility of association, it is further explained as association agrees with current understanding of response of cells, tissues, organs and systems to stimuli. **Example:** Food intake and cancer are interrelated that is positive association of intestine, rectum and breast cancers are biologically logical, no positive association of food and skin cancer.

Cigarette smoking and lung cancer hypothesis is biologically plausible. It is visualized that inhalation of hot smoke into lungs and deposition of chemical carcinogen over a period of time probably building to a threshold level and initiating neoplastic changes in the lungs.

Coherence of association: Appraisal of causal significance of an association and its coherence is relevant. **Example:** historic evidence of rising consumption of tobacco in the form of cigarettes and rising incidence of lung cancer are coherent. Male and female differences in trends of lung cancer death rates are also coherent. Death rates are increasing in male and also rising trends in female due recent adoption of smoking in female. It is also evident that fall of relative risk of lung cancer when cigarette smoking is stopped.

Q17 b: Describe the biases in epidemiological studies.

Q19. How can you estimate the disease risk in 'case-control study'? What are the biases in analytical studies (case-control study) including the process of elimination as applicable?

(WBUHS, 2016, 2022; GNSUB, 2022; ABKUB, 2019; BNMUB, 2021, 2023; VKSUAB, 2018; PBDSUHSH, 2013; YSRUHSAP, 2021; RGUHS, 2012, 2014; TDMGRMU, 2014, 2016; SSUHSA, 2011, 2016, 2024; SMU, 2015; RUJH, 2013; MGUB, 2023; MU, 2023; TRIU, 2024)

Ans: Case-control study can measure the exposure rate among both the cases and control groups. Exposure of some suspected factors can be found out accordingly in cases and control population. This exposure rate of suspected factors may be higher in case population. This indicates that this factor may act as risk among suffering population. On the contrary, suspected factor may be higher in rate in control group and this may indicate its beneficial effects of that factor. Suspected associated factors may be analyzed through Chi square or Odds ratio to assess the risk caused by that factor. In this way, we can estimate the disease risk through 'case-control study'.

Bias is systematic error in determination of the association between the exposure and disease. The estimation of relative risk may increase or decrease due to bias. It shows some type of non-comparability between the study and control groups.

The following biases are seen in case-control study and its elimination (minimize):

Biases	Its elimination (minimize)
Selection bias: This is a bias when sample selection does not represent the whole population.	This bias can be minimized by proper sample selection technique and adequate sample size for conducting the study. Strict criteria should be followed for inclusion and exclusion of cases in the study. Thus, selection bias can be eliminated.

Contd...

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Biases	Its elimination (minimize)
Bias due to confounding: Since the confounding factor can cause the disease, so care should be taken while selecting the cases and controls. Confounding factors should not be present in both the cases and controls.	Proper matching between cases and controls can minimize this kind of bias.
Memory or recall bias: Memory may stupefy both the interviewee and the interviewer. The recall of events should be better among the cases even though there is a possibility of recall or memory bias. Memory of short duration may be recalled.	This can be minimized by using biological markers of exposure.
Interviewer's bias: As interviewer knows who the study group is and who is the control group, so there may be bias in asking questions in the suspected cases.	This may be overcome by double blind study, good check lists and giving good length of time of interview of cases as well as controls.
Berkson's bias: Joseph Berkson, who is the first person to recognize this problem. This occurs in hospital-based studies because the patients with different diseases with different rates of admission to hospitals.	Representative population in ratio, intensity, etc., will not be available in hospital. It is better to avoid hospital cases and controls.
Measurement bias: It is due to fault in measuring instruments.	Calibration of instrument.
Migration bias: It is due to dropout of few participants on account of deaths, recovery, side effects of treatment, etc.	This can be reduced utilizing the denominator time-person in any kind of study.

CM7.2: Enumerate, describe and discuss the modes of transmission of communicable diseases.

Q20. Discuss different modes of transmission of diseases. *(BNMUB, 2022; YSRUHSAP, 2023; SAMU, 2009; SSUHSA, 2020, 2021; SMU, 2013; NU, 2011, 2014; BUMP, 2016; SDVPG, 2023; DBRAUA, 2024)*

Ans: There are two broad modes of disease transmission.

A. **Direct transmission:**

- **Direct contact:** This is really direct contact from skin to skin, mucosa to mucosa or mucosa to skin of same or another person. The infectious agents are transmitted to the susceptible host by touching, kissing or sexual intercourse. Diseases transmitted by direct contact are STI and AIDS, leprosy, leptospirosis, skin and eye infections, etc.
- **Droplet infection:** This direct projection of a spray of droplet from saliva and nasopharyngeal secretions during coughing, sneezing or speaking and spitting and talking in the surrounding atmosphere. Particles of 10 μm diameter are filtered of by nose. Particle of 5 μm or less in diameter can reach the lung alveoli. 30-60 cm distance is important between source to host. Diseases are transmitted by droplet infection are respiratory infections, common cold, diphtheria, whooping cough, tuberculosis. It is aggravated by overcrowding and lack of ventilation.
- **Contact with soil:** Hookworm larvae, tetanus and mycosis are the common problem.
- **Inoculation into skin or mucosa:** Rabies virus by dog bite, hepatitis B virus through contaminated needles and syringes are examples of inoculation.
- **Transplacental (vertical):** The disease agent can be transmitted transplacentally. Examples are TORCH agents (*Toxoplasma gondii*, rubella virus, cytomegalovirus and herpes virus), varicella virus, hepatitis B, syphilis, coxsackie B, AIDS and malaria. Some non-living agents (thalidomide, diethylstilbestrol) can also transmit vertically.

B. **Indirect transmission:**

a. *Vehicle borne:* Vehicle borne transmission implies transmission of infectious agent through water, food (including raw vegetables, fruits, milk and milk products) ice, blood and blood products. Diseases transmitted by food and water are acute diarrheal diseases, typhoid fever, cholera, polio, hepatitis A, etc. Diseases transmitted by blood are hepatitis B, malaria, syphilis, brucellosis, etc.

b. *Vector borne:*

- **Mechanical transmission:** The infectious agent is mechanically transported by a crawling of flying arthropod through soiling of its feet or proboscis or by passage of organisms through its gastrointestinal tract and passively excreted. There is no development of multiplication of the infectious agent on or within the vector.
- **Biological transmission** *(WBUHS, 2008, 2009; RGUHS, 2012; TDMGRMU, 2011; SSUHSA, 2007, 2011, 2024; SMU, 2013; RUJH, 2012, 2018; VBUJH, 2023)*

Biological transmission is an example of indirect transmission. The infectious agent undergoing replication or development or both in vector and requires an incubation period before vectors can transmit. Biological transmission are of three types, viz.

Propagative: Agent merely multiplies in vector, but no change in form, e.g., **plague bacilli in rat fleas.**
Cyclopropagative: The agent changes in form and number. **Example is malaria parasite in mosquitoes.**
Cyclodevelopmental: The disease agent undergoes only development, but no multiplication, e.g., **microfilaria in mosquitoes**.

c. *Air borne:*
Droplet nuclei: They are tiny particles (1–10 microns in range) that represent the dried residue of droplets. Diseases, such as tuberculosis, influenza, chickenpox, measles and respiratory infections spread in this way. **Dust-larger droplets** which are expelled during talking, coughing or sneezing settle down by their sheer weight on the floor, carpets, furniture, clothes, bedding. Diseases spread by dusts are streptococcal and staphylococcal infection, pneumonia, tuberculosis.

d. *Fomite borne:* Fomites include soiled clothes, towels, linen, handkerchief, cups, spoons, pencils, books, toys, taps, syringes and surgical dressings. Diseases transmitted diphtheria, typhoid fever, hepatitis A, etc.

e. *Unclean hands and fingers:* Diseases transmitted are streptococcal and staphylococcal infection, typhoid fever and hepatitis A.

Q14. Define source and reservoir of infection. Describe in detail dynamics and modes of disease transmission. *(YSRUHSAP, 2023; TDMGRMU, 2008; SSUHSA, 2009; RUJH, 2013, 2014; SDVPG, 2023; RGUHS, 2024)*

Ans: Source: Source is a person, animal, object or substance from which an infectious agent passes or is disseminated to the host.

Reservoir: *Reservoir is any person, animal, arthropod, plant, soil or substance* (or combination of these) wherein infectious agent lives and multiplies, on which it primarily depends for survival, and where it reproduces itself in such a manner that it can be transmitted to a susceptible host.

Dynamics of disease transmission: Medical model of disease transmission has been in the following **(Fig. 7.3)** here are three links in the chain of transmission, viz, source or reservoir, modes of transmission and susceptible host.

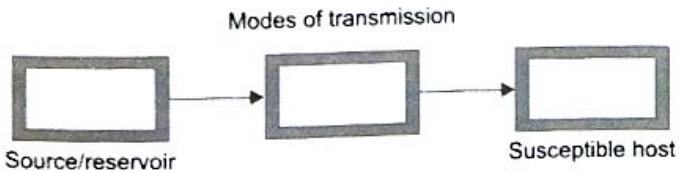

Fig. 7.3: Chain of transmission.

Usually, communicable diseases are transmitted from the reservoir/source of infection to susceptible host. In other words, the reservoir is the natural habitat in which the organism metabolizes and replicates. The terms reservoir and source are not always synonymous and the term source refers to the immediate source of infection and may/may not be a part of reservoir.

Types of reservoir: Human reservoir, animal reservoir and reservoir in nonliving thing.

Human reservoir: A human case or carrier is the most important source or reservoir of infection for man. A case is a person in the population or study group identified as having particular disease, health disorder or condition under investigation.

Q22. Type of cases. *(BNMUB, 2019; SSUHSA, 2020; VNSGUS, 2023)*

Ans:

Clinical cases	May be mild, moderate, severe or fatal
Subclinical cases	In-apparent, covert, missed or abortive. It can be detected only by laboratory tests. Antibody response, biochemical test and skin sensitivity tests are done to identify a subclinical case.
Latent infection	The patient does not shed the infectious agent which lies dormant in host without symptoms. Herpes simplex is one of the examples.

Types of cases in epidemiology:

Primary case	The first case of a communicable disease introduced into the population unit being studied
Index case	First case came in attention of investigator. It may not always be the primary case.
Secondary case	Secondary case is one that develops from contact with primary case.

Carrier: It is an infected person or animal that harbors a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection for other susceptible population.

Type of carriers: Based on health status, carrier can be classified as follows.

Incubatory carrier	They shed the infectious agent during the incubation period of the disease. Examples are mumps, measles, polio, pertussis, etc.
Convalescent carrier	Carriers shed the disease agent during the period of convalescence. Examples are typhoid fever, dysentery, cholera, diphtheria, etc.
Healthy carrier	Emerge from subclinical cases. Examples are poliomyelitis, cholera, meningococcal meningitis, etc.

According to duration, they can be divided in the following way:

Temporary carriers	They shed the infectious agent for short period of time. It includes incubatory, convalescent and healthy carrier.
Chronic carrier	Chronic carriers excrete the infectious agent for indefinite period. Examples are typhoid, hepatitis-B, dysentery, malaria, gonorrhea, etc.

According to portal of exit, carriers are as follows:

Urinary carrier	Typhoid
Intestinal carrier	Typhoid, amoebiasis, poliomyelitis
Biliary carrier	Typhoid
Nasal carrier	Diphtheria
Genital carrier	Gonorrhea

Animal reservoir: Many animals which act as reservoir and transmit the diseases to human beings.

Animal reservoir	*Diseases transmitted*
Cattle	Bovine tuberculosis, salmonellosis, tetanus, *Taenia saginata*, brucellosis
Horses	Tetanus
Dogs	Rabies
Monkeys	Yellow fever, dengue fever
Sheep	Anthrax
Pigs	Japanese encephalitis, *Taenia solium*
Rodents	Plague, leptospirosis, endemic typhus
Birds	Psittacosis, histoplasmosis

Reservoir in nonliving thing: Soil and inanimate matter can also act as reservoir of infection. Tetanus, anthrax, mycetoma and ancylostomiasis are few of examples.

Mode of transmission: Already answered in Q.20.

Susceptible host: Susceptible host is one who is likely or prone to develop the disease and shows the four stages of successful parasitism.

a. **Portal of entry:** The infectious agent must find a portal of entry by which it may enter the host. Examples are alimentary tract, respiratory tract and genitourinary tract.
b. **Site of election**: On entry into the host, the organisms must reach the appropriate tissue or site of election in the body of the host where it may find optimum conditions for its multiplication and survival. It is also called **"Target Organ."**
c. **Portal of exit:** The disease agent must find a way out of the body in order to reach a new host and propagate its species. If there is no portal of exit the infection becomes dead-end. Examples are bubonic plague, rabies, tetanus, Japanese encephalitis, etc.
d. **Survival in external environment:** After exit from human host, the organism must survive in the external environment for sufficient period till a new host is found.

A successful disease agent is one which has a portal of entry, portal of exit, a site of election, survives in the external environment, enters a new host, propagates its species and does not cause the death of host but produce only a low-grade immunity so that the host is vulnerable again and again to the same infection, for example common cold virus.

Q23. Give a brief account of different types of human reservoir of infection. Describe in brief the methods of controlling reservoir. *(WBUHS, 2019)*

Ans: Different types of human reservoir of infection are discussed in Q.21.

Methods of controlling reservoir: Human reservoirs may be eliminated. Here it truly means they will be converted from infectious person who is spreading the disease agent into non-infectious person.

A. **Early diagnosis:** Whenever symptoms appear in a person, immediate action should be taken for early diagnosis. Accordingly prompt treatment can be done to make the person non-infectious.
B. **Notification:** In case of incidence of diseases in a locality, this information should be transmitted to the higher health authority who will send specialist manpower to take immediate control measure reducing the number of reservoirs.
C. **Epidemiological investigation:** This is important to assess the load of the problems, to identify the causative agent and mode of spread and ultimately to take necessary action to control, eliminate the infections.
D. **Isolation:** The patient may be isolated in such a way that he will not come in contact with a susceptible person reducing the spread. At the same time, he will be given appropriate management in isolated situation.
E. **Quarantine:** Suspected person may be detained in airport or seaport area for the longest incubation period of the suspected disease. Thus, his health is taken care of and spreading of disease may be reduced.
F. **Treatment:** A person who is suffering from an infectious disease may be given proper treatment so that he will become non-infectious. Cases will be healthy person reducing the spread of disease.

Q24.2: Enumerate, describe and discuss measures for prevention and control of communicable diseases.

Ans: Prevention and control of communicable diseases:

A. Controlling sources of infections through health promotion:
- *Health education:* This is one of the most cost-effective interventions for health. In primary healthcare approach, health education has been positioned at the beginning. There are many diseases (both communicable and noncommunicable) which can be prevented applying the knowledge in real field. Practice is followed by knowledge. If individuals possess knowledge, then they can apply it in real

life situations with positive attitude. Health issues are selected first for a particular group of people depending upon their age, sex, occupation, education, society, etc. If practice is properly adopted by individuals, reduction of disease incidence will be observed in the population.

- *Environmental modifications:* Provision of potable water in its absence, installation of sanitary latrine, improvement of houses are examples of intervention of environmental modification. This will reduce incidence of common food and water-borne diseases.
- *Nutritional intervention:* Food distribution and nutrition improvement of vulnerable groups (Child, mothers), nutrition education to mothers, food fortification, etc., are examples of nutrition intervention which will minimize nutrition disorders.
- *Lifestyle and behavioral changes:* The lifestyle and behavioral pattern play their role in determination of many health problems and keep health normal in favorable behavior. Tobacco use, alcohol use, lack of exercise, overeating, etc., can cause medical problems providing health burden. On the contrary no tobacco, no alcohol, regular exercise, optimum eating will help the individuals for maintenance of good health.

B. **Specific protection through specific protection:** Under Universal Immunization Program (UIP) 12 vaccines are being used for vaccine preventable diseases (VPDs). These vaccines are Bacillus Calmette-Guérin (BCG) vaccine, Oral polio virus (OPV) vaccine, hepatitis B vaccine, inactivated polio vaccine (IPV), Pentavalent vaccine, *Rotavirus* vaccine, pneumococcal conjugate vaccine, measles vaccine, measles-rubella vaccine, Japanese encephalitis vaccine (JE), diphtheria, pertussis, tetanus (DPT) vaccine, Td/TT. The purpose of immunization is to ensure high level of coverage and to prevent outbreaks as also to reduce the incidence of disease and ultimately to eliminate and eradicate the communicable diseases.

C. **Early diagnosis and treatment:** To reduce the burden of communicable diseases, such as tuberculosis, leprosy, filariasis, malaria, dengue, etc., early diagnosis and complete treatment is of outmost important under various national program of CCDs.

D. **Practice of chemotherapy and chemoprophylaxis:** Mass chemoprophylaxis or chemotherapy or campaigns are not related to individual case management. Under various national health program mass chemotherapy for filariasis, malaria, worm infestation and isoniazid prophylaxis in HIV are being used.

E. **Food safety:** Hand washing before and after food, maintaining healthy cooking procedures, keeping food at safe temperature, using safe water and clean utensils and pasteurization of milk.

F. **Blood safety:** Screen blood for HIV, syphilis, hepatitis B, hepatitis C and malarial parasite before transfusion.

G. **Surveillance**

H. **Notification of diseases:** Cases and deaths of 20 communicable diseases in India are reported every month by all health facilities. Cholera, yellow fever and plague are internationally notifiable diseases along with other public health emergencies of international concern, such as COVID-19. TB is also a notifiable disease in India.

I. **Quarantine**

J. Community participation through involvement of the community—controlling vectors, sanitation and safe water.

CM7.2: Describe and discuss measures for prevention and control of noncommunicable diseases (NCDs).

Noncommunicable diseases (NCDs) cover wide range of heterogenous conditions affecting different organs and different ages and socioeconomic groups. Over the last two decades, mortality and morbidity of some NCDs, such as cardiovascular diseases, cancer, mental disorders and trauma has been rising due to following factors:

A. Rise in life expectancy and increasing number of senior citizens
B. Changing lifestyles
C. Use of tobaccos
D. Exposure to environmental risk factors-air pollution
E. Increasing number of vehicles, automobiles causing trauma

F. Multifactorial Origin

Prevention and control of NCDs:

A. Health care for senior citizens as well as general population from public and private healthcare settings
B. Regular exercise as per body condition and advice from physicians
C. Restricted use of all forms of tobacco
D. Ensure medical, engineering and legislative measures in the industries for safe of the health workers and fulfilment of ESI benefits as applicable.
E. Strict law and order for vehicular movement, awareness for safe driving.

CM7.4: Define, calculate and interpret morbidity indicators based on given set of data.

Q24. Give a brief note on basic measurements of epidemiology (Write in brief rate, ratio and proportion). *(WBUHS, 2019; ABKUB, 2023; TRIU, 2020, 2024; SAMU, 2004; SSUHSA, 2006, 2010; RUJH, 2021)*

Ans: Basic measurements on epidemiology:

	Rate	*Ratio*	*Proportion*
Definition	• Rate is a measure of occurrence of an event (disease incidence or death) in a population during a given time period • It is a statement of the risk of developing a condition and indicates the change in some event that takes place in a population over a period of time • It is basically a proportion but with an added relationship with time	Ratio is a relative in size between two random quantities obtained by dividing one quantity by another	Proportion is a ratio which indicates the relation in magnitude of a part of the whole
Expressed as	Expressed per 1000 or some other round figure (10,000:100,000) selected according to the convenience or convention to avoid fractions	Express as x: y or x/y	Expressed percentage
Components	• Numerator (usually a component of denominator) • Denominator • Time specification (usually a calendar year) • Multiplier	• Numerator (not a component of denominator) • Denominator both may involve an interval of time or may be instantaneous in time	• Numerator (always a component of denominator) • Denominator
Example in a hypothyroidism study	Rate of hypothyroidism in females = Total no. of female patients in a year/Total female study population × 1000	Ratio of female patients to male patients = No. of female/no. of males	Proportion of female patients = No. of female patients/total no. of patients
Other examples	Death rate, birth rate, infant mortality rate	Maternal mortality rate, sex-ratio, doctor-papulation ratio, child-women ratio, etc.	Under 5 proportional mortality rate, proportional mortality rate
Significance	Rate helps the epidemiologist compare frequency or rate of a particular event in a community with that of another community	Ratio gives idea of another very important measure, i.e., the odds	Proportion gives idea of an important measures in research methodology, i.e., the probability

Examples of tools of measurements and its interpretation:

Parameter	Conclusion
Infant mortality rate (IMR)	Rate
Maternal mortality rate (MMR)	Ratio
Sex ratio (SR)	Ratio
Incidence	Rate
Prevalence	Proportion
Case fatality rate (CFR)	Proportion
Relative risk (RR)	Ratio

Morbidity indicators are discussed in the next questions.

Q25. Define incidence and prevalence of disease with their relation. *(WBUHS, 2012, 2019, 2020; BNMUB, 2016, 2018, 2019; DU, 2006, 2016; SSUHSA, 2013, 2020; TRIU, 2016, 2020, 2022; YSRUHSAP, 2017; RGUHS, 2004, 2008, 2014; SMU, 2012; NU, 2010; BUMP, 2016; SAMU, 2022; MGUB, 2023, 2024; RUJH, 2023, 2024; VBUJH, 2022; SDVPG, 2023)*

Ans: Incidence rate: This is proportion of population who developed disease or health-related state(s) in a particular time period in one geographic area per unit population.

$$\textbf{Incidence} = \frac{\text{Number of new cases of a specified disease during a given time period}}{\text{Population at risk during that period}} \times 1{,}000$$

For example, if there had been 500 new cases of an illness in a population of 30,000 in a year. The incidence rate would be: 500/30,000 × 1000 = 16.7 per thousand per year. It will be seen from the definition that incidence rate refers only to new case, during a given time period, in a specified population or population at risk.

Prevalence: The term disease prevalence refers specifically to all current cases (old and new) existing at a given point in time or over a period of time in a given population. Prevalence is of two types—point prevalence and period prevalence. Prevalence rate is a proportion. **Numerator is a part of denominator and always expressed in percent.**

Point prevalence: It is defined as number of all current cases of a disease at one point of time in relation to a defined population. The 'point' consists of a day, or several days, or even a few weeks depending upon the time, it takes to examine the population sample.

$$\textbf{Point prevalence} = \frac{\text{Number of all current cases (old and new) on a specified disease existing at a given point in time}}{\text{Estimated population at the same point in time}} \times 100$$

Period prevalence: It is less commonly used. It measures the frequency of all current cases existing during a defined period of time expressed in relation to a defined population.

$$\textbf{Period prevalence} = \frac{\text{No. of existing cases of a specified disease during a given period of time interval}}{\text{Estimated mid-interval population at risk}} \times 100$$

Difference between incidence and prevalence *(SDVPG, 2023)*

Incidence	Prevalence
It is the occurrence of new case only	It is both new and old cases
It is express per 1000 population	It is expressed in 100 population
It is estimated from longitudinal studies	It is estimated from cross-sectional studies
It is not influenced by duration of illness (P = I × D)	It is influenced by duration of illness
It refers to acute cases with short incubation period, e.g., food poisoning	It refers to chronic cases with long incubation period, e.g., TB, cancer

Relation with incidence and prevalence: *(MGUB, 2023)*

Prevalence depends upon two factors, incidence and duration of illness. If we assumed that the population is stable and incidence and duration of disease is unchanging, the relationship between incidence and prevalence can be expressed as:

$P = I \times D$, where P = Prevalence, I = Incidence and D = Duration of illness

Example for a stable population,

Incidence - 5 cases per 1000 population per year

Mean duration of disease = 5 years

So, prevalence = $5 \times 5 = 25$ per 1000 population.

The above equation shows that **longer the duration of disease, greater the prevalence**. Tuberculosis has a high prevalence rate relative to incidence. New cases of tuberculosis added throughout the year. **On the other hand**, if the disease is acute or short duration because of rapid recovery or death, prevalence rate will be relatively low compared to incidence rate. Example, food poisoning, the disease is short lived, there are no old cases.

Prevalence has been compared with a photograph, an instantaneous record and incidence with a film, a continuous record.

Q26. Measurement of morbidity. *(BNMUB, 2014, ABKUB, 2021, 2023)*/**Morbidity indicators.** *(WBUHS, 2018; MGUB, 2022; TRIU, 2021; RGUHS, 2008; DU, 2012, 2013; NU, 2009, 2006)*/**Briefly mention the measurements of morbidity in epidemiology.** *(BNMUB, 2014; SAMU, 2011; TDMGRMU, 2008, 2010; SDVPG, 2023)*

Ans: Indicators are used to measure health status of a community of a certain area. Measurement of morbidity is such an indicator. This reveals the burden of diseases in a community. These are used to supplement the mortality rates. The following morbidity rates are used for assessing the health status:

- Incidence rate
- Prevalence rate
- Notification rate
- Outpatient attendance rate
- Hospital admission and discharge rate
- Duration of stay in hospital

For calculating any rate, we need numerator, denominator, time specification and a multiplier.

Incidence rate: It is the number of new cases of a particular disease occurring per 1000 (unit) population in a year.

Prevalence rate: It is the total number of both old and new cases existing in the population during a given period of time. It is expressed in percent, i.e., percentage of the population suffering from a particular disease.

Q27. What is secondary attack rate? *(BNMUB, 2005; ABKUB, 2018, 2023; MU, 2022; RGUHS, 2013; TDMGRMU, 2010; SMU, 2010; BUMP, 2012; RUJH, 2010; MGUB, 2024; TRIU, 2024)*

Ans: Secondary attack rate (SAR) is defined as the number of exposed persons developing the disease within the range of the incubation period, following exposure to the primary cases. It is given by the formula:

$$SAR = \frac{\text{Number of exposed persons developing the disease within the range of the incubation period}}{\text{Total no. of exposed/susceptible contacts}} \times 100$$

The denominator consists of all persons who are exposed to the primary case. Most specifically, the denominator may be restricted only to susceptible contacts. The primary case is excluded from both the numerator and denominator. The following example may clarify the matter. Say, there is a family of 6 members consisting of 2 parents and 4 children who are susceptible to a specific disease, such as measles.

There occurs a primary case and within a short time 2 secondary cases among the remaining children. Here the first case will be kept aside from the calculation. 2 cases will be the number of exposed susceptible persons developing the disease and susceptible persons will be 3 putting as denominator. Thus, secondary attack rate is $2/3 \times 100$ or 66.6%. Secondary attack rate is limited in its application to infectious diseases in which the primary case is infective for only short period of time measured in days. When the primary case is infective over a long period of time, duration of exposure is an important factor in determining the extent of spread. It is indicated by the formula for tuberculosis.

$$\text{SAR} = \frac{\text{Number of contacts developing tuberculosis}}{\text{Number of person-weeks of exposure}} \times 100$$

An additional advantage of the secondary attack rate is that vaccinees and non-vaccinees from several families can be added to determine the overall attack rates in the vaccinated and unvaccinated persons. it is used to evaluate the effectiveness of control measures in some disease.

CM7.4: Define, calculate and interpret mortality indicators based on given set of data.

Q28. Uses and limitations of mortality data. *(MGUB, 2022, 2023; AKUB, 2023)*

Ans: Uses of mortality data are:

- These data are used in explaining trends and differentials in overall mortality indicating priorities for health action and allocation of resources.
- It gives important clues for epidemiological research.
- Assessment and monitoring of public health problems before undertaking an intervention program.

Limitations of mortality data are:

- Incomplete reporting of deaths
- Lack of accuracy
- Lack of uniformity
- Choosing a single causing of death
- Changing coding system
- **Disease with low fatality:** Mental diseases, arthritis

Mortality indicators *(AFUH, 2022; VKSUAB, 2019; MU, 2022; GNSUB, 2023)*

Important mortality indicators are:

- Infant mortality rate
- Under-5 mortality rate
- Crude death rate (CDR)
- Age-specific death rate
- Standardized death rate
- Proportional mortality rate
- Case fatality rate
- Expectation of life

Q29. What is crude death rate and its limitation? *(RGUHS, 2009)*

Ans: Crude death rate (CDR) is defined as the number of deaths per 1000 population per year in a given community. It indicates the rate at which people are dying.

$$\text{CDR} = \frac{\text{Number of deaths in an area in a year}}{\text{Total mid-year population}} \times 1{,}000$$

Total mid-year population: Population size changes daily due to births, deaths and migration, hence the mid-year population is commonly chosen as a denominator, **the mid-point refers to the population estimated as on the first of July of a year.**

Current status of CDR in India: As per SRS 2020, CDR is 6.0 per 1000 population

Limitations: It is called crude because the whole population (estimated mid-year population) is used as denominator. But in many countries, crude death rate is the only available indicator of health. When it is used for international comparison, the usefulness of CDR is restricted because age-sex composition of population is not taken care of.

Q30. Describe age-specific indicator of health. *(SSUHSA, 2015)*

Ans: Age-specific indicators of health: Death rate is crude indicator which cannot be compared to assess the status of health of two or multiple areas or states or countries. In particular when light on etiology is concerned, then specific death rate is primarily required in terms of age, disease, gender, age and gender, time, etc.

Let us take the example of age specific death rates: Death rate can be expressed for specific age group in a defined population. An age specific death rate is defined as total number of deaths occurring in a specific age group of population (20–24 years) in a defined area during a specific period per 1000 estimated total population of the same age group in the same area during the same period.

$$\textbf{Age-specific death rate for 18–30 years group} = \frac{\text{Number of deaths of persons aged 18–30 years during a year}}{\text{Mid year population of persons aged 18–30 years}} \times 1{,}000$$

Similarly, disease specific death rate, sex-specific death rate is also calculated.

Q31. What is standardized death rate? *(RGUHS, 2010)*

Ans: The death rate corrected for age-sex distribution of population is called standardized death rate. It is used to compare death rates of two populations with different age group compositions. Apart from age, adjustment can be made for sex, race and parity, etc.

There are two standardization methods; direct and indirect standardization.

Direct standardization: *(TDMGRMU, 2012)*

- Standard population is selected
- Age-specific death rates of population whose crude death rate is to be standardized is calculated
- Expected number of deaths in standard population is often obtained.
- Total expected deaths are calculated by adding all expected deaths.
- Standardized age adjusted death rate is calculated by dividing the total expected deaths by total standard population and estimated per 1000 population.

Indirect standardization:

- Select a series of standard death rates of different ages
- These rates are applied to population under study to get expected rates.
- Observed death figure should be known

Example of indirect standardization:

- Standardized mortality ratio
- Life table analysis
- Survival analysis
- Regression analysis
- Multivariate analysis

Q32. What is standardized mortality ratio (SMR)? *(WBUHS, 2018)*

Ans: It **is simplest and most useful form of indirect standardization**. The standardized mortality (ratio is usually expressed in percent) of total number of deaths that occur in study group to the number of deaths

that would have been expected to occur, if that study group had experienced the death rate of a standard population (or other reference population). In other words, SMR compares the mortality in a study group (e.g., an occupational group) with a mortality that the occupational group would have had if they had experienced national mortality rates. In this method of study, the more stable rates of larger population are applied to the smaller study groups. It gives a measure of the likely excess risk of mortality due to the occupation.

$$\textbf{SMR} = \frac{\text{Observed deaths}}{\text{Expected deaths}} \times 100$$

If the SMR is greater than 100, the occupation would appear to carry a greater mortality risk than that of whole population. If SMR less than 100, then the occupation risks of mortality would seem to be proportionally less than that of whole population.

$$\textbf{SMR} = 9/7.5 \times 100 = 120$$

Table 7.1 shows that the mortality experience of coal workers was 120%, which meant that their mortality was 20% more than that experienced by the national population. If the values more than 100% indicates unfavorable mortality experience and those below 100%, it indicates relatively favorable mortality experience.

Advantage of SMR: SMR has the advantage over the direct method of age adjustment in that it permits adjustment for age and other factors where age-specific rates are not available or unstable because of small numbers. Only requirement is, the number of persons in each group in the study population and age-specific rates of the national population.

Table 7.1: Calculation of the SMR for coal workers.

Age	National population death rates per 1,000	Coal worker population	Observed deaths	Expected deaths
25–34	3.0	200	*	0.6
35–44	5.0	400	*	2.0
45–54	8.0	300	*	2.4
55-64	25.0	100	*	2.5
		1,000	**9**	**7.5**

*It is not necessary to know these values; only the total for the whole age range is required.

Q32a. Describe proportional mortality rate. *(TDMGRMU, 2009)*

Ans: Proportional mortality rate: This is the number of deaths for a particular disease among all deaths in a population. It is the simplest measure of estimating the burden of a particular disease in a community. The proportional mortality rate from communicable diseases has been suggested as a useful health status indicator. It may indicate the magnitude of preventable mortality.

Proportion of death of mothers due to hemorrhage in one year in a hospital among all deaths of mother in same time period is one of proportional mortality rate. Antenatal or postnatal hemorrhage can be prevented in many cases of mortality.

The calculation of proportional mortality rate can be seen in the following way:

$$\textbf{Proportional mortality rate} = \frac{\text{Number of deaths from a particular disease}}{\text{Number of all deaths in the same area}} \times 100$$

Q33. What is case fatality rate and its significance? *(WBUHS, 2018; TRIU, 2023; MGUB, 2022; TDMGRMU, 2008; VNSGUS, 2023; SDVPG, 2023; KIMS, 2024)*

Ans: Case fatality rate (CFR) measures the risk of persons dying from a certain disease within a given period of time. It is calculated as number of deaths from a specific disease during a specific time period divided by total number of cases of the disease during the same time period expressed in percent.

$$\text{Case fatality rate (CFR)} = \frac{\text{Total no. of death due to a disease}}{\text{Total no. of cases due to a disease}} \times 100$$

Significance: It is used to link mortality and morbidity, measure pathogenicity, severity.

Q84. Describe survival rate. *(TDMGRMU, 2011)*

Ans: **Survival rate (SR):** It is proportion of survivors in a group of patients, studied/followed up over a period of time (example 5 years). It is used to understand prognosis of a disease under study, such as cancer. Survival period is calculated from date of diagnosis or start of treatment.

$$\text{SR} = \frac{\text{Total number of patients alive after 5 years}}{\text{Total number of patients diagnosed/treated}} \times 100$$

Q85. What is life expectancy? *(RGUHS, 2010)*

Ans: Life expectancy at birth is **"the average number of years that will be lived by those born alive into a population if the current age-specific mortality rates persist."** It is influenced by infant mortality rate. When we say life expectancy at age 1, this excludes the influence of infant mortality and life expectancy at age 5, this excludes the influence of child mortality. **It is estimated separately for both sexes. It is a very good indicator of socioeconomic development of a country. It is a positive health indicator, hence adopted as a global health indicator.**

Q86. Under-5 mortality rate is a good index of social development of a country—sustainable. *(BNMUB, 2021)*

Ans: $$\text{U-5 mortality rate} = \frac{\text{Number of child deaths under 5 years of age in an area in one year}}{\text{Total number of live births in the same year and same time period}} \times 1{,}000$$

This rate can be used to reflect both infant and child mortality rates. High rate inflects high birth rates, high child mortality rates and shorter life expectancy. Currently, U-5 mortality rate 36 asper SRS 2018 (published in May 2020) but target is 23 by 2025 as per National Health Policy. Infant mortality rate is currently 32 but as per NHP 28 by 2019. Newborns, infants and young children up to 4 years of age constitute 8.3% of total population. They are most vulnerable to diseases and deaths. Their prime health needs are survival, feeding (breastfeeding, exclusive breastfeeding, complementary feeding), early childhood care and education, growth and development, timely immunization and management of childhood illness, such as malnutrition, measles, malaria, ARIs and diarrheal diseases under IMNCI guidelines. These group of children are the supreme assets and future human resources of any country. Hence, the health services provision should be an over-riding priority including enhancement of literacy level.

CM7.7: Describe and demonstrate the steps in the investigation of an epidemic of communicable disease and describe the principles of control measures.

Q87. A few cases of jaundice have occurred in boys' hostel. How will you investigate and control it? *(WBUHS, 2008; VKSUAB, 2018)*

Q87A. Significant number of cases of jaundice were reported from an urban locality. As a public health expert how do you investigate it and what remedial measures do you suggest for the problem? *(WBUHS, 2017; KIMS, 2019; TRIU, 2023; AKUB, 2023; VNSGUS, 2023)*

Ans: **Investigation of an epidemic:** Occurrence of an epidemic signals some significant shift in existing balance between the agent, host and environment and calls for prompt and through investigation to uncover responsible factor and to guide in advocating control measures to prevent further spread.

Objectives of investigation: Control of a disease requires investigations on the issue of importance where issue of health importance has arrived, such as jaundice in a hostel. The following objectives should be achieved in the investigation:

a. To define the magnitude of the problem in terms of time, place, person
b. To determine particular conditions and factors responsible for occurrence of disease
c. To identify causes, source of infection, mode of transmission
d. To take control measures and to make recommendations to prevent recurrence

Following steps or procedure of epidemic investigation: *(KIMS, 2021, 2023; TRIU, 2021; AFUH, 2023; MGUB, 2024; DBRAUA, 2024)*

Steps or procedure	Action to be taken
a. Verification of diagnosis	• It is the first step. • It is necessary to have the verification of diagnosis on spot as quickly as possible. • It is necessary to examine all cases but clinical examination of a sample of cases suffice. • Whether applicable laboratory investigation is most useful to confirm the diagnosis.
b. Confirmation of existence of an epidemic	• An epidemic is confirmed by comparing the disease frequencies during the same period of previous year. • If the number of cases observed is in excess of the expected frequency for that population based on previous experiences, then it is labeled as epidemic. • An arbitrary limit of two standard errors from the endemic frequency is used to define the epidemic threshold for common diseases. • Common source epidemics, such as food-poisoning/cholera need no comparison. • However modern epidemics, such as cardiovascular diseases need comparison with previous experience.
c. Defining the population of risk: i. Obtaining a map of the area	• A current map of the area showing details, such as natural landmarks, roads and location of dwellings is necessary. • If map is not available, it should be prepared. • The area should be divided into segments using natural landmarks as boundaries and again subdivided into smaller sections.
ii. Counting the population	• Population helps in computing the attack rates in various groups and subgroups. • This entire population or subgroup forms the denominator. • Without an appropriate denominator of population at risk attack rates cannot be calculated.
d. Rapid search for all cases and their characteristics	• A medical survey should be carried out in the defined area to identify all cases including those who have not sought medical help or those probably exposed to risk. • The health worker can collect relevant data through epidemiological case sheet or questionnaire.
i. Medical surveys	• A complete health survey will pick up all affected individuals with signs and symptoms of disease.
ii. Epidemiological case sheet	• It is a case sheet or interview form used for data collection from cases and from people apparently exposed but unaffected. • It should include following questions to collect information: Name, age, gender, occupation, social class, travel history, history of previous exposure, onset of disease, signs and symptoms, personal contact at home, school, working place, social gatherings attended and food items eaten, exposure of common vehicle, such as water, milk and food, history of foreign trips and history of injections or blood products received. • However, information collected should be relevant to the disease under investigation. • In case of large outbreaks, random samples should be examined and data collected.
iii. Searching for more cases	• More cases can be searched by asking the patient if he/she knew of other cases in home, family, neighborhood, schoolwork place, etc., having an onset within the incubation period of the index case. • Cases admitted in local hospital should be considered which may reveal additional cases and information about person-to-person spread. • This activity should be carried out every day till the area is declared epidemic free, i.e., no new case should be detected in period twice the incubation period of disease since occurrence of last case.

Contd...

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Steps or procedure	Action to be taken
e. Evaluation of ecological factors	• To prevent further transmission of the disease an investigation into the circumstances involved is mandatory • Sanitary status of eating establishments, milk and water supply • Breakdown in the water supply • Movement of the human population • Atmospheric changes, such as temperature, humidity and air pollution • Population dynamics of insects and animal reservoirs • The study helps to determine the source of infection, reservoirs and modes of transmission.
f. Further investigation of population at risk	• Additional information can be obtained by study of population at risk by medical examination screening tests, examination of suspected food, feces or blood sample, biochemical studies assessment of immunity status, etc. • The approach may be prospective or retrospective.
g. Data analysis	• Using the classical epidemiological parameters, such as time, place and person (agent, host-environment if causative agent is known), the collected data is analyzed on an ongoing basis. • It is done to identify common events or experience and to delineate the group involved in common experience.
i. Time	• An epidemic curve is constructed by plotting dates of onset in chronological order to suggest: – A time relationship with exposure to a suspected source – Where it is a common source or propagated epidemic – Whether it is a seasonal or cyclic pattern suggestive of a particular infection
ii. Place	• A spot map of detected cases is prepared showing their relationship with possible source of infection, if possible. • Clustering of cases, suggest common source epidemic
iii. Person	• Data collected is analyzed by age, gender, occupation and other risk factors. • Case fatality rate or attack rate is determined for those exposed and those not exposed and according to host factors.
h. Formulation of hypothesis	On the basis of data collection, hypothesizes are formulated in order of relative likelihood to explain the epidemic in terms of: • Possible source • Causative agent • Modes of spread • Environmental factors
i. Testing of hypotheses	• All reasonable hypotheses need to be considered and weighted by comparing the attack rate in various groups for those exposed and those not exposed to each suspected factor • This helps to ascertain which hypothesis is consistent with all the known facts
j. Writing report	The report should be complete and convincing include: • Introduction and background information of the area affected • Population at risk, data collection methodology, data analysis, case management • Control measures, conclusion and recommendations • Feedback should be given to the all-relevant department—hostel authority, college authority, local health authority and district health authority.

Preventive measures: Collaboration with local municipality/water supply authority is essential, if there is any defect in the distribution system.

- Water should be purified at hostel level by boiling/domestic filters, etc.
- Utensils should be clean and containers should be covered
- Hand dipping should be avoided
- Maintenance of food sanitation, kitchen hygiene should be followed by hostel mess workers
- Infected food handlers should not be allowed to handle the item
- Rules of hygiene including hygienic food handling should be observed at each level
- Areas used for food storage, cooking, serving should be kept clean.

Q37c. **Several cases of fever with rash have been reported from urban slum of a town. As a medical officer of a CHC how shall you investigate these cases and what measures would you, such as to take to prevent such outbreak in future?** *(BNMUB, 2014)*

Q37d. **How would you investigate an epidemic of fever in your block?** *(WBUHS, 2012, 2020)*

Ans: **Management of fever cases:**

- Absolute bed rest is given during epidemic
- Symptomatic treatment with antipyretics and antibiotics is arranged
- Maintaining fluid and electrolyte balance is very important issue
- Preventive measures are simultaneously considered
- Collaboration with local municipality/water supply authority, if there is any defect in the distribution system.

Q37e. **An outbreak of cholera has occurred in your block. Discuss the methods of epidemiological investigation and control.** *(BNMUB, 2004, 2006)*

Q37f. **Define steps of investigation of food poisoning in a hostel.** *(ABKUB, 2019; SSUHSA, 2011, 2017; PBDSUHSH, 2017)*

Ans: Management of cholera and food poisoning cases: Oral rehydration therapy should be started. IV fluids according to dehydration status may be required. Antibiotics, such as Fluoroquinolones/Tetracycline/Azithromycin/Cotrimoxazole, etc., may be specifically advised for killing of germs.

Q37g. **After attending the school picnic, large number of students developed diarrhea and vomiting within 12 hours. How do you investigate the problem?** *(WBUHS, 2019; TRIU, 2022, 2023)*

Q37h. **After having dinner with fried rice, egg curry and salad in a hostel, 20 students complained of vomiting and diarrhea at midnight and another 15 students reported the same complaints in the morning. How do you investigate the outbreak and control measure?** *(WBUHS, 2015; RGUHS, 2001)*

Q37i. **Describe how you will investigate an epidemic outbreak of diarrheal diseases in your PHC area as a medical officer in-charge.** *(TRIU, 2014, 2016, 2022; SSUHSA, 2008, 2010, 2023; MU, 2022)*

Q37j. **An outbreak of gastroenteritis has occurred in a hotel, describe the steps of investigation and suggest preventive measure for further occurrence.** *(SSUHSA, 2015)*

Q37k. **An outbreak of gastroenteritis in a village after food. Suggest how will you manage the situation and prevent the disease in future.** *(WBUHS, 2022; KIMS, 2014)*

Q37l. **An outbreak of diphtheria has occurred in subcenter area. How will you investigate and control the outbreak?** *(BNMUB, 2002)*

Ans:

- Early detection
- Isolation
- Treatment of cases and treatment of carriers *(ABKUB, 2023)*

Q37m. **Discuss the steps of investigation as a Health Officer to reduce the source of infection about the outbreak of typhoid in a student hostel in an urban area.** *(BNMUB, 2005; SAMU, 2016; RUJH, 2016)*

Ans: **Management of typhoid cases:**

- Isolation is not absolutely necessary. Sewage disposal should be sanitary one.
- **Antibiotic therapy:** Typhoid cases are treated with fluroquinolones/Cotrimoxazole/Ampicillin/Injection ceftriaxone, etc.

- **Disinfection:** Stools and urine are the sole sources of infection. They should be received in closed containers and disinfected with 5% cresol for at least 2 hours.
- **Follow-up:** Follow up examination of stool and urine should be done for *S. Typhi*, 3–4 months after the discharge of the patient and again after 12 months to prevent the development of carrier state.

Management of typhoid carriers: *(ABKUB, 2019)*

Since carriers are the ultimate source of typhoid fever, their identification and treatment are one of the most crucial aspects of controlling typhoid fever. Recommended measures:

- **Identification:** Carriers are identified by cultural and serological examination
- **Treatment:** The carrier should be given an intensive course of ampicillin or amoxycillin together with probenecid for 6 weeks.

CM7.9: Describe and demonstrate the application of computers in epidemiology.

Q38. Application of computers in epidemiology. *(ABKUB, 2019, 2023; SDVPG, 2023; MGUB, 2024)*

Ans: Computer made it much easier to process, store and retrieval. This technology can produce tabulations, graphs and generate reports. It helps in online transmission of routine reports generated by health facilities are now being transmitted through it. Data entry operations have been employed at the level of PHC, CHC, district and state level to transmit reports quickly in the system.

The main uses of computers in health sciences are as follows:

a. Easy access to, and full exploitation of statistical tools
b. Exploring relationship of variables in data sets
c. Access to national/international literature and instant selective retrieval
d. Quick and more effective communication facilities using technologies, such as electronic mail (e-mail)
e. Record archiving
f. Use of diagnostics tools in selecting appropriate treatment and in assessing progress

Different software packages are available, such as Epi-info, epidemiological information processing system. Among the commonly used packages are Microsoft, excel, SPSS, SAS, Minitab, Systat, NCSS, etc. For special purpose, we have nQuery Adviser; StatXact; Solas; Sigmastat and Epilnfo.

Q39. Role of IT in changing scenario of public health. *(BNMUB, 2021)*

Ans: Information technology (IT) can be defined as, **"the study or use of systems (especially computers and telecommunications) for storing, retrieving and sending information".** It is the utilization of electronic media for storing digital information that can be easily retrieved from its stored format at the time of transmission intended for ease in its communication and utilization.

The concept of use of IT in community health care (CHC) has been strengthened with the launch of **Digital India Campaign** by Government of India on 1st July 2015. In the modern digitalized world, the relevance of this topic is self-explanatory to medical undergraduates who cannot think of separating themselves from their smart devices even during daily activities of living, such as toileting, mouth care, bathing, dressing, grooming and eating. This will lay ground for how they can utilize modern electronic media during their professional roles as community healthcare providers. The overall success of digital India program and Ayushman Bharat warrants that community healthcare professionals irrespective of the state in their professional career must understand and endorse.

The utility of IT in CHC can be elaborated on the following subtopics:

1. e-health and m-health
2. Telemedicine and community health
3. Health education, training, monitoring, epidemic forecasting
4. Electronic health records (EHR)
5. Health management information system (HMIS)

- RMNCH+A (Reproductive, maternal, newborn, child and adolescent health)
- CMIS/MMS (Computerized Management Information System/Strategic Information Management System) in NACP (National AIDS Control Program)
- Reporting in Integrated Disease Surveillance Programme
- Mother and child tracking system (MCTS)
- Nikshay in NTEP

Initiative in e-health and m-health:

- Vital statistics
- Birth and death entry application system
- Maternal child tracking system (MCTS)
- e-Mamta
- **Child health:** Rashtriya Bal Swasthya Karyakram (RBSK)

SHORT NOTES AND RELEVANT QUESTIONS

Q40. What is epidemiological triad, triangle of epidemiology? *(AKUB, 2022, 2023; AIIMS 2022, BNMUB, 2017, 2022; SMU, 2012, 2013; TDMGRMU, 2005; RUHS 2016, SSUHSA, 2013; RUHH, 2011; TRIU, 2020, 2022, 2023; SAMU, 2022; SDVPG, 2023; VSSUT, 2023)*

Ans: Epidemiological triad: It is interaction between agent, host and environment.

Example: Not everyone exposed to tuberculosis develops tuberculosis. Again, not everyone exposed to beta-hemolytic streptococcus develops acute rheumatic fever. There are other factors. Host and environment play important role whether or not disease will occur in the exposed host. It helped epidemiologists to focus on different classes of factors, especially with regards to infectious diseases.

Triangle of epidemiology. *(BNMUB, 2014)*
This is a triangle, and it is based on communicable disease model and useful in showing the interaction and interdependence of agent, host, environment and time as used in investigation of diseases and epidemics. The agent is the cause of disease, the host is an organism usually a human or an animal, that harbors the disease. The environment is those surroundings and conditions external to human or animal that cause or allow disease transmission; and time accounts for incubation periods, life expectancy of the host and duration of the course of illness or condition **(Fig. 7.4)**.

Agent, host and environment make a triangle where these three factors are inter-related and in their favorable condition, disease may be one of the outcomes in course of time.

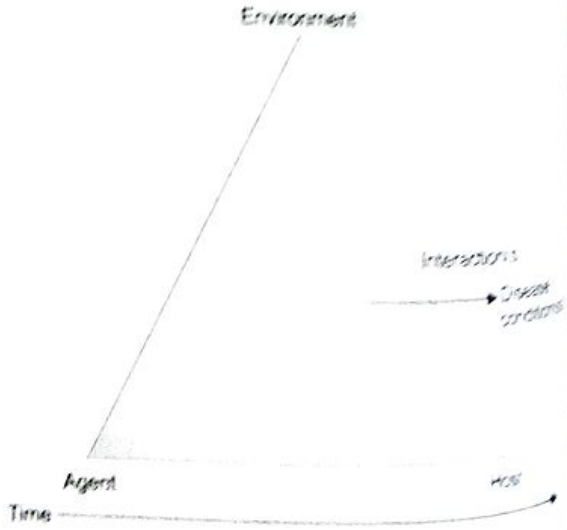

Fig. 7.4: Triangle of epidemiology

Q41. Define the term 'endemic and epidemic'. Mention the different types of epidemic with suitable examples and illustrations. *(ABKUB, 2023; TRIU, 2012; SSUHSA, 2011, 2017; MU 2021)*

Ans: Endemic: [En = in, demos = people]
The constant presence of a disease or infectious agent within a given geographical area or population group without importation from outside can be taken as endemic.

Type of endemicity: Hyperendemic - The disease is highly present in all age group.
Holoendemic - The disease is highly present in early age group.

Consequence - Endemic can give rise to epidemics.
Number of cases calculated by average number of cases in previous years indicates its presence.

Epidemic: [Epi = upon, demos = people].
The unusual occurrence of disease, specific health-related behavior or events clearly in excess of expected occurrence in a community or region is defined as epidemic. **Number of cases calculated by mean + 2 SD is usually taken as epidemic over expected occurrence.**
Examples: Measles, chickenpox, cholera, etc., may occur in such way.
Types: Single exposure or point source, continuous or multiple exposure, propagated and slow epidemic.
Consequence: Epidemic can give rise to pandemics.

Difference between epidemic and outbreak. *(SAMU, 2022; VBUJH, 2023)*

Comparison points	*Epidemic*	*Outbreak*
Definition	Unusual occurrence of a disease in a community or region clearly in excess of expected occurrence	Occurrence of more cases of disease than normally expected within a specific place or group of people over a given period of time
Number of cases	Very large	Small
Geographical location	Large	Limited
Death rate	Above average	Below average
Loss	Human, animal and economic	Human
Reporting	Mandatory	Optional

Q42. Explain the difference between epidemic, endemic, pandemic and sporadic.
(BNMUB, 2016; RGUHS, 2008; SMU, 2014; BUMP, 2012; NU, 2013, 2014)

Ans: The difference among epidemic, endemic, pandemic and sporadic is explained in the tabular form.

	Epidemic	*Endemic*	*Pandemic*	*Sporadic*
Definition	The unusual occurrence in a community or region of disease, specific health-related behavior or events clearly in excess of expected occurrence	The constant presence of a disease or infectious agent within a given geographical area or population group without importation from outside	An epidemic usually affecting a large proportion of population over a wide geographical area, such as a section of a nation, entire nation, a continent or the world	Cases which occur irregularly, haphazardly from time to time and generally infrequently
Consequence	Can give rise to pandemics	Can give rise to epidemics	Can affect population at large	It may be starting point of an epidemic under favorable conditions
Geographical location	Large	Small	Very large	Small
Example	Measles, chickenpox, cholera, polio outbreaks	Malaria, leprosy and Endemic goiter	Acute hemorrhagic conjunctivitis 1971, 1981 and COVID-19 in 2020	Chickenpox

Q42a. Difference between iatrogenic infection, nosocomial infection and opportunistic infection.

	Iatrogenic/Physician acquired	*Nosocomial/Hospital acquired infection*	*Opportunistic infection*
Meaning	An infection induced by a health care provider, such as Physician, Nurse, Paramedical workers as a consequence of diagnostic or therapeutic or preventive procedure	An infection acquitted by a patient during the stay in hospital	An infection caused by an organism/s that takes the opportunity provided by the host due to breakdown of the immune mechanism (host)
Example	Hepatic B or HIV infection following injection or blood transfusion	Infection acquired from surgical ward, urinary tract infection following catheterization	The common opportunistic organisms are *M. tuberculosis*, herpes simplex virus, cytomegalovirus. It is common in case of HIV/AIDS infections

Q43. What do you mean by nosocomial infection? How does it differ from opportunistic infection?

(AKUB, 2022; BNMUB, 2014; RGUHS, 2013; SSUHSA, 2016; DU, 2008; NU, 2013; SMU, 2009; ABKUB, 2023)

Ans: Nosocomial infection is hospital acquired infection. Nosocomial infection is an infection originating in a patient while in hospital or other health facility. It includes infection acquired in hospital but appearing after discharge and also such infection among the health staff. Examples are surgical wounds, hepatitis B and urinary tract infection (UTI).

Opportunistic infection is caused by an organism that takes the opportunity provided by a defect in host defense. The host is affected even by very ordinary infection which might not occur in normal host defense. The organisms include herpes simplex, cytomegalovirus, Toxoplasma, *Mycobacterium tuberculosis*, *Pneumocystis carinii*, etc.

Opportunistic infection is very common in AIDS. Immunocompromised condition in HIV infection aggravates varied types of infection, such as *Mycobacterium tuberculosis, Pneumocystis carinii*. In normal health, *Pneumocystis carinii* infection is rare.

From this above text, we can now easily differentiate nosocomial infection and opportunistic infection.

Q44. Discuss the hospital-acquired infection (Nosocomial infection) and its prevention.

(ABKUB, 2012; PBDSUHSH, 2017; SSUHSA, 2016, 2021; DU, 2008; TRIU, 2020; MGUB, 2024)

Ans: Hospital-acquired infection (Nosocomial infection) is acquiring infection from the hospital by the patients or other susceptible persons during their stay at hospital and its manifestation occurs during hospital stay or at home after discharge.

Prevention of hospital-acquired infection (Nosocomial infection)

Elimination of the reservoirs or sources:

- **Care of the staff:** Staff suffering from skin, respiratory, alimentary infection should not attend duties.
- **Care of the patients:** Acute infectious cases should be admitted in isolation ward.
- **Treatment:** Correct and complete treatment should be provided.
- **Nursing care:** Barrier nursing or task nursing may be considered to reduce infection.

Breaking the channel of transmission:

- Hand wash with soap and water after touching the infected patient
- Isolation of infectious cases may be followed
- Concurrent disinfection of patient's body discharges
- Measures to be taken to stop droplet mode of transmission
- Control of infected dust

Protection of susceptible persons:

- Care of susceptible persons should be specially taken.
- Vaccination may play a fair role to prevent some infections.

- Universal precautions for blood and body fluids should be followed. Administrative measures also can be taken to reduce these nosocomial infections.

Q45. Man, today is viewed as an "Agent" of his own disease—Justify. *(WBUHS, 2019)*

Ans: His/her state of health is determined more by what he/she does to himself/herself than what some outside germ or infectious agent does to him/her. Example, the medical cause of lung cancer may be a chemical substance in cigarettes but psychological cause is behavior-smoking. From psychological point of view, disease may be viewed as a maladjustment of human organism to his psychological environment resulting from misconception, misinterpretation and misbehavior. The epidemiologist today is more concerned with psychological environment than physical or biological environment for searching etiological causes of a disease.

Q46. What is the confounding in epidemiological study? *(WBUHS, 2021, 2024; TRIU, 2024)*

Ans: In an epidemiological study of the association between exposure to a cause (or risk factor) and the occurrence of disease, **confounding** may occur when another exposure exists in the study population and it associated both with the disease and the exposure being studied. A problem arises if this extraneous factor, itself a determinant or risk factor for the health outcome, is unequally distributed between the exposure subgroups. Confounding occurs when the effects of the two exposures (risk factors) have not been separated and it is therefore incorrectly concluded that the effect is due to one rather than the other variable. **For example**, in a study of the association between tobacco smoking and lung cancer, age would be a confounding factor if the average ages of the nonsmoking and smoking groups were very different since lung cancer incidence increases with age. **Another example**, confounding may be the explanation for the relationship demonstrated between coffee consumption and risk of coronary heart disease, since it is known that coffee consumption is associated with cigarette smoking. People who drink coffee are more likely to smoke than people who do not drink coffee.

Q47. Importance of cross-product ratio/odds ratio. *(SAMU, 2016; NIMSUR, 2015; TRIU, 2024)*

Ans: In a case-control study, odds ratio or cross product ration is a measure of strength of association between risk factors and outcome. It is measured in the following way:

Contingency table on smoking and lung cancer:

	Cases (with lung cancer)	*Controls (without lung cancer)*	*Total*
Smokers	35 (a)	52 (b)	87 (a + b)
Non-smokers	3 (c)	29 (d)	32 (c + d)
Total	**38**	**81**	**119 n = a + b + c + d**

Note: Smokers (less than 5 cigarette a day)
Cases = a/a + c = 35/38 = 92.10%
Control = b/b + d = 52/81 = 64.19%

$$\text{Odds Ratio} = ad/bc = \frac{35 \times 29}{52 \times 3} = 6.5$$

Interpretation of odds ratio: Smokers of less than 5 cigarettes per day showed a risk of having lung cancer 6.5 times than that of non-smokers. Odds ratio is a key parameter in analysis of case-control studies.

Q48. Define relative risk and attributable risk. *(MGUB, 2022; ABKUB, 2011, 2017, 2021; SMU, 2013; DU, 2013, 2015; NU, 2017; BUMP, 2010; SSUHSA, 2018; MUHS, 2019; BNMUB, 2020; TRIU, 2024)*

Ans: The strength of association in cohort study is determined by relative and attributable risk.

Difference between relative risk and attributable risk *(TRIU, 2023; PBDSUHSH, 2017)*

Relative risk	*Attributable risk*
It is the extent to which the exposed persons are at risk of developing the disease than the unexposed	It is the extent to which the suspected factor is attributed as the cause of the disease
It is calculated as the ratio of incidence of disease among exposed and incidence of disease among unexposed persons (IE/IU)*	It is calculated as the ratio of risk difference and incidence among the exposed. [(IE-IU)/IE]*
This is an absolute number	It is often expressed in percent
It measures the strength of association between the suspected cause and the disease	It suggests the extent to which the disease can be prevented if suspected cause is eliminated

Note: *IE = Incidence among exposed, IU = Incidence among unexposed

Relative risk (RR) is the ratio of the incidence of disease among exposed and the incidence of disease among non-exposed.

$$\textbf{Relative risk (RR)} = \frac{\text{Incidence of disease among exposed}}{\text{Incidence of disease among non-exposed}}$$

Contingency table on cigarette smoking and lung cancer:

Cigarette smoking	*Developed lung cancer*	*Not developed lung cancer*	*Total*
Yes	80 (a)	7920 (b)	8000 (a + b)
No	5 (c)	4995 (d)	5000 (c +d)
Total	85 (a + c)	9915 (b + d)	13000 (a + b + c + d)

Incidence rates:

- Among smokers 80/8000 per 1000, i.e., 10 per 1000
- Among non-smokers 5/5000 per 1000, i.e., 1 per 1000

From the above hypothetical table:

$$\text{RR of lung cancer} = \frac{10}{1} = 10$$

Interpretation: Incidence of lung disease among persons exposed to risk factor(s) is higher or equal or lower than that among non-exposed persons.

Estimation of relative risk (RR) is important in etiological enquiries. It is a direct measure of the strength of association between suspected cause and effect. A relative risk of 2 indicates that the incidence rate of disease is 2 times higher in exposed group as compared with un-exposed.

In our hypothetical example, relative risk is 10. It indicates that smokers are 10 times at greater risk of developing lung cancer than non-smokers. The larger the RR, the greater the strength of association between the suspected factor and disease. It is noted that risk does not necessarily imply causal association.

Attributable risk: Attributable risk (AR) is the difference in incidence rates of disease between an exposure group and non-exposure group.

$$\textbf{Attributable risk (AR)} = \frac{\text{Incidence of disease rate among exposed - Incidence of disease among non-exposed}}{\text{Incidence rate among exposed}} \times 100$$

$$\text{AR from above mentioned table is} = \frac{10-1}{10} \times 100 = 90\%$$

AR implies to what extent the disease under study can be attributed to the exposure. From the above figure, we understand that 90% of lung cancer among smokers was due to their smoking.

Interpretation: Amount of disease that might be eliminated if the factor under study could be controlled or eliminated.

Q49. Population attributable risk. *(SMU, 2015; NU, 2017; WBUHS, 2019)*

Ans: It is a measure of estimation of risk in a cohort study. It is the incidence of the disease (or death) in the total population minus the incidence of disease among those who were not exposed to the suspected causal factor.

Example: Lung cancer death among smokers and non-smokers

- Arbitrary figure
- Heavy smoker 225 (a) exposed to suspected factor
- Non-smokers 10 (b) non-exposed to suspected causal factor
- Deaths in population 70 (c)

$$\text{Population AR} = \frac{c-b}{c} \times 100$$
$$= \frac{70-10}{70} \times 100$$
$$= \frac{60}{70} \times 100$$
$$= 85.71\%$$

Interpretation: The concept of population attributable risk is useful in that it provides an estimate of the amount by which the disease could be reduced in that population if the suspected factor was eliminated or modified. From the above example, we come to a conclusion that about 85% of deaths from lung cancer could be avoided if the risk factor of cigarettes were eliminated.

Q50a. Epidemiologically carriers are more dangerous than cases—Justify with examples. *(WBUHS, 2009, 2013, 2023; MGUB, 2023; SSUHSA, 2023; SMU, 2013; VNSGUS, 2023)*

Q50b. Carrier, though less infectious are epidemiologically dangerous. *(WBUHS, 2017; TRIU, 2024)*

Q50bb. Carriers in Typhoid *(ABKUB, 2024)*

Q50c. Carrier stage of disease is not amenable to control—Explain. *(WBUHS, 2010; TRIU, 2023; MGUB, 2024)*

Ans: Carrier is defined as an infected person or animal that harbors a specific agent in the absence of discernible clinical disease and serves as a potential source of infection for others. The elements in the carrier states are the presence of disease agent in the body of a person, the absence of recognizable symptoms and signs of disease and the shedding of the disease agent in the discharge or excretions, thus acting as a source of infection for other persons. As a rule, carriers are less infectious than cases, but epidemiologically more dangerous than cases, because they escape recognition due to absence of symptoms and signs but are continuing spreads as these persons live a normal life among the population of community. They readily infect the susceptible individuals over a wider area and longer period of time under favorable condition. Example is typhoid fever. A chronic carrier is an evident for typhoid fever. **Example is typhoid fever in typhoid Merry.** Cases spread the disease in the community but they are identified soon and get treatment for recovery. As the carriers are moving from one place to another without any restriction, there are no clinical symptoms and signs; often they are not under treatment and shedding the disease agent in discharge or secretion. They are not suspicious in the broad society as they are not showing any abnormal findings.

So, epidemiologically carriers are more dangerous than cases and also carrier state is not amenable to control.

Q51. Difference between primary case and index case. *(ABKUB, 2014)*

Ans: **The term primary case** in epidemiology refers to the first case of a communicable disease introduced into the population unit being studied.

The term index case refers to first case in attention of investigator. It may not always the primary case.

Q52. Vector. *(BNMUB, 2002; ABKUB, 2004)*

Ans: Vector is defined as an arthropod or any living carrier (mosquito/snail) that transports an infectious agent to a susceptible individual. Thus, diseases transmitted by vectors to humans are known as vector-borne diseases. Vector-borne diseases are part of communicable diseases.

Types of vectors:

By nature of vectors:

- **Invertebrate:** Mosquitoes, fleas, mites, cyclops, etc.
- **Vertebrate:** Mice, rodents, etc.

By transmission chain:

- **Man and a nonvertebrate host:** Malaria
- **Man, a nonvertebrate host, a vertebrate host:** Japanese encephalitis
- **Man, two invertebrate hosts:** Fish tapeworm

By methods of agent transmission:

- Biting
- Regurgitation
- Scratching-in of infective feces
- Body fluid contamination

By involvement of vectors:

- **Mechanical transmission:** Acute diarrheal diseases by flies
- **Biological transmission:**
  - *Propagative:* Plague bacilli in rat flea
  - *Cyclopropagative* Malaria
  - *Cyclodevelopmental:* Filaria
  - Transovarial transmission
  - Trans-stadial transmission

Influencing factors for transmission of diseases by vectors: There are some factors which influence the transmission of diseases by different vectors. These factors are host feeding preferences, infectivity, susceptibility, survival rate of vectors, domesticity, suitable environment, etc.

Vector-borne diseases: Diseases covered under National Vector Borne Disease Control Program (NVBDCP) are Malaria, Filaria, Japanese encephalitis, Dengue, Chikungunya and Kala-azar.

Q53. The terms "source" and" reservoir" are not always synonymous—Explain.
(WBUHS, 2016, 2022; TRIU, 2012)/**Reservoir.** *(BNMUB, 2004)*

Ans: The starting point for the occurrence of a communicable disease is the existence of a reservoir or source of infection. The source of the infection is defined as the person, animal, object, substances from which an infectious agent passes or is disseminated to host.

A reservoir is defined as any person, animal, arthropod, plant, soil or substance in which an infectious agent lives and multiplies, on which depends primarily for survival and where it reproduces itself in such manner, that it can be transmitted to a susceptible host. The reservoir may be of three types:

1. Human reservoir
2. Animal reservoir and
3. Reservoir in non-living things

These two terms are very close. Sometimes, these may be the same. But the terms "source" and "reservoir" are not always synonymous. For example, in Hookworm infection, the reservoir is man, but the source of infection is the soil contaminated with infective larvae. In tetanus, reservoir and source are same that is soil. In typhoid fever, the reservoir of infection may be a case or carrier, but the source of infection may be feces or urine of the patient or contaminated food, drink, water. Thus, the term source refers to the immediate source of infection and may/may not be a part of reservoir.

Q24. Death (International) certificate. *(BNMUB, 2004; RGUHS, 2008; NU, 2012)*

Ans: The basis of mortality data is death certificate. It helps in ascertaining the frequency of disease. It is very necessary to have a uniform and standardized system of recording and classifying deaths for national and international comparability. It has two parts. **Part I includes immediate cause and underlying cause. Part II includes any significant associated diseases that contributed to death but did not directly lead to it (Fig. 7.5).**

Immediate cause means disease or condition directly leading to death. This does not really mean mode of dying, such as heart failure. This really means the injury or disease or their complications which caused the death. Underlying cause is also called antecedent cause which means a morbid condition giving rise to disease or condition leading to death.

Other significant associated conditions or diseases mean the diseases or conditions which are not related to the disease or condition causing it, but death is contributed by this condition.

Cause of death:

I

Approximate interval between onset and death

Disease or condition (a) _____ directly leading to death due to (consequence of)

Antecedent cause (b) _____

Morbid condition, if any, due to (consequence of) giving rise to the above cause (c) _____

II

Other significant conditions _____ contributing to the death, but not related to the disease or condition causing it

Fig. 7.5: Specimen of death certificate.

To fill in the gap of the death certificate, example may be placed. In part I, (a) can be "Bronchopneumonia", (b) can be "Peritonitis", (c) can be "Appendicular lump" and in part II, blank can fill by diabetes, hypertension, etc.

It is very important to note that in the death certificate following information are very much required:

- Name should be clearly written as per Aadhar card/Bank documents/Pension pay order
- Post office/Police station should be written exactly for medicolegal case, if raised
- Registration no. of the Physician and Name of the State/Other Medical Council should be mentioned along with.

Q25. Droplet infection *(BNMUB, 2004)* and airborne infection. *(BNMUB, 2020)*

Ans: **Droplet infection is one of the examples of direct transmission**. This is direct projection of a spray or droplets of saliva and nasopharyngeal secretion during coughing, sneezing, speaking or spitting, talking into the surrounding atmosphere. The expelled droplets may impinge directly upon conjunctiva, oro-respiratory mucosa or skin of close contact. Particle of 10 μm or greater in diameter are filtered off by nose. Those 5 μm or less can penetrate deeply and reach the alveoli. The droplet spread is usually limited to a distance of 30-60 cm between source and host. In infectious diseases, these droplets, which may contain millions of bacteria and viruses can be a source of infection to others. When a healthy susceptible person comes within the range of these infected droplets, he is likely to inhale some of them and acquire infection.

Diseases transmitted by droplet infection include respiratory infection, eruptive fevers, common cold, diphtheria, whooping cough, tuberculosis, meningococcal meningitis, etc. The potential for droplet spread is increased in condition of close proximity, overcrowding and lack of ventilation.

Airborne infection: TB, such as common cold, influenza, is an airborne infection. TB spreads through the air from one person to another. When a person with tuberculosis of lung (open case) coughs, sneezes, talks or even signs or laughs, bacteria are sprayed out into the air as infectious droplets. These droplets dry up rapidly and the smallest of them remain suspended in the air for several hours. People nearby, such as household or family contacts may inhale these bacteria and become infected. Droplet nuclei disperse rapidly throughout the air in the room and can be carried whenever air currents take them. Influenza is another example of airborne transmission.

Q56. Pandemic. *(ABKUB, 2022; BNMUB, 2002, 2023; RGUHS, 2002, 2024; TDMGRMU, 2012; BUMP, 2012)*

Ans: When an epidemic is affecting a large proportion of population occurring over a wide geographic area such as a section of the nation, the entire nation, a continent or the world, this situation is called pandemic. Geographically, it is larger than epidemic.

Examples of pandemics are influenza caused by influenza A virus, AIDS caused by HIV, etc. This influenza virus is unique among the viruses, because it is frequently subjected to antigenic variation, both major and minor. When there is a sudden, complete or major change, it is called antigenic shift. It appears to result from genetic recombination of human with animal or avian virus, providing a major antigenic change. This can cause a major epidemic or pandemic involving most or all age groups. AIDS is showing a downward trend now. **Other examples of pandemic are cholera EI Tor in 1962, acute hemorrhagic conjunctivitis in 1971 and 1981 and COVID-19 in 2020.**

Q57. Zoonosis. *(BNMUB, 2006; SAMU, 2007, 2011; TRIU, 2013; TDMGRMU, 2012; NU, 2007; BUMP, 2013; KIMS, 2019; RGUHS, 2024; VNSGUS, 2023)*

Ans: Zoonosis is an infection or infectious disease transmissible under natural condition from vertebrate animal to man. The diseases include rabies, plague, bovine tuberculosis, anthrax, brucellosis, salmonellosis, endemic typhus, hydatidosis, etc. In recent years, several new zoonoses have emerged, such as Kyasanur forest disease, monkeypox, Lassa fever, etc.

The term zoonoses have further amplified as follows:

Anthropozoonoses: This means infections transmitted from vertebrate animals to man. Rabies, plague, hydatid disease, anthrax are few examples of this variety.

Zooanthroponosis: This is infection transmitted from man to vertebrate animals. Human tuberculosis in cattle is an example.

Amphixenosis: Infections maintained in both man and lower vertebrate animals that may be transmitted to either direction. *Trypanosoma cruzi, Salmonella japonicum* can be transmitted in this way.

Zoonoses and human health are matters of particular concern in India, because nearly 80% of the Indian population is rural and live in close contact with domestic animals and often not far from the wild ones. Control of zoonotic disease is a real challenge in developing countries, such as India. The developing countries suffer much more from losses of lives than do the industrialized countries, partly because they have less well-developed public health and veterinary services, unfavorable climatic and environmental conditions.

A classification of zoonoses is based on the type of life cycle of infecting organisms and that divides the zoonoses into four categories, each with important shared epidemiological features. Four categories are direct zoonoses, cyclozoonoses, metazoonosis and saprozoonoses.

Q58. Difference between monitoring and surveillance with examples. *(ABKUB, 2014; BNMUB, 2020; RGUHS, 2013; TDMGRMU, 2014; TRIU, 2012; NU, 2014, 2017; RUJH, 2009, 2011; PBDSUHSH, 2013, 2015; DBRAUA, 2024)*

Ans: Difference between monitoring and surveillance are discussed here:

Points of difference	Monitoring	Surveillance
Definition	Performance and analysis of routine measurements aimed at detecting changes in environment or health status of a population	Continuous scrutiny of the factors that determine the occurrence and distribution of disease and other condition of ill-health
Type of activity	One-time, linear activity	Continuous process
Inbuilt action	Absent	Present
Concept	Smaller	Broader
When to stop	After elimination/eradication of the problem	Continued for further indefinite period in accordance with cause

Q. Monitoring and surveillance are not synonymous—Explain. *(WBUHS, 2019, 2023; AKUB, 2022; BNMUB, 2014, 2017; RGUHS, 2013; TDMGRMU, 2014; ABKUB, 2008, 2014; TRIU, 2012; SMU, 2011; DU, 2014; SSUHSA, 2023)*

Ans: **Monitoring** can be defined as a process of measuring, recording, collecting and analyzing data on actual implementation of the program and communicating it to program managers so that any deviation from the planned operation is detected. Diagnosis for the cause of deviation is carried out and suitable corrective actions are taken.

Monitoring is done frequently (daily) during the implementation of the plan and is one of the manager's day-to-day responsibilities. It may be done by direct observation, discussions and reviewing statistics and reports.

Surveillance is the continuous scrutiny of the factors that determine the occurrence and distribution of disease and other conditions of ill-health. In other way, surveillance can be called as data collection for action. Data will provide status of the situation and accordingly action can be taken. The main objectives of surveillance are:

- To provide information about new and changing trends in health status of population; e.g., morbidity, mortality of the population
- To provide feedback; this can be expected to modify the policy
- To provide timely warning of public health disasters so that intervention can be mobilized.

From this discussion, it can be concluded that monitoring and surveillance cannot be synonymous.

Q. Epidemic curve. *(WBUHS, 2021, 2022; ABKUB, 2021; RGUHS, 2010, 2013; SAMU, 2015; TDMGRMU, 2010; MUHS, 2019)*

Ans: Epidemic curve is the graphical representation of time distribution of the cases during an epidemic and it is plotted in a graph paper considering the number of cases against the dates **(Fig. 7.6)**.

The caseload of a particular time period in a particular area and population is compared with caseload of previous years. If it is found that the present caseload is clearly in excess of expectation (beyond the limit of previous years' findings), then epidemic is considered locally, regionally or globally. We can have an idea of an epidemic observing in **Figure 7.6** considering period of 2016.

Caseloads of the same kind of disease in the same area of same population were represented graphically here for the year of 2014, 2015 and 2016. In 2016, cases were found very high in comparison with cases of 2014 and 2015. Arbitrarily + 2 SD increase of caseloads is picked up as an epidemic from statistical point of view.

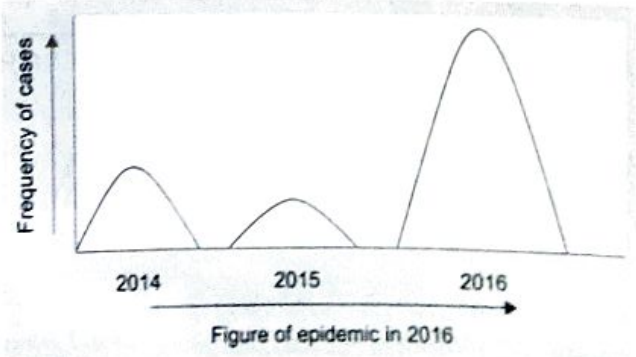

Fig. 7.6: Epidemic curve.

Q61. Usefulness of knowing incubation period.

(WBUHS, 2017, 2021; ABKUB, 2021; YSRUHSAP, 2023; KIMS, 2021, 2023; RGUHS, 2009; TDMGRMU, 2015; BUMP, 2012; TRIU, 2013; MGUB, 2023; SSUHSA, 2023; VNSGUS, 2023)

Ans: Incubation period is defined as a "the time interval between invasion (successful entry of a pathogen) by an infectious agent and the appearance of the first sign or symptoms of the disease in question".

Usefulness of knowing incubation period is summarized below:

- **For making diagnosis:** Short incubation period helps in making diagnosis. Food poisoning, gonorrhea are few of the examples.
- **To trace the contact or source of infection:** In long incubation period, the source or contact can be traced. Thus, it helps in implementation of control measures.
- **For quarantine purposes:** Quarantine means limiting the movement of healthy persons, who are suspected to have been exposed to a communicable disease. For such a period equal to the longest incubation period of the disease, a suspected person may stay in isolation for his/her monitoring in respect of health.
  This method was adopted to prevent the international spread of diseases, such as smallpox, cholera, plague and yellow fever by quarantining those who were not producing valid International Certificate of Vaccination in the international airports and seaports.
- **For immunization purposes:** The at-risk person can be protected by immunizing with human immunoglobulins and antisera after exposure to disease by making use of the long incubation period as in tetanus, rabies, etc.
- **Identification of point source or propagated epidemic:** All cases occurring within one incubation period indicates point source epidemic and cases occurring later than the known length of incubation period is seen in propagated epidemics.
- **Prognosis:** Prognosis is related to the duration of incubation period. Shorter the incubation period, worse is the prognosis as in case of tetanus and rabies, etc.

Q62. What is extrinsic incubation period? *(RGUHS, 2004; TDMGRMU, 2011; GOAU, 2022)*

Ans: Extrinsic incubation period: It is the time required for the disease agent to undergo multiplication or phase of cyclic development or both, inside the body of arthropod **(Fig. 7.7)**. Examples of extrinsic incubation period are seen in cases of malaria, filaria and yellow fever (10 to 14 days).

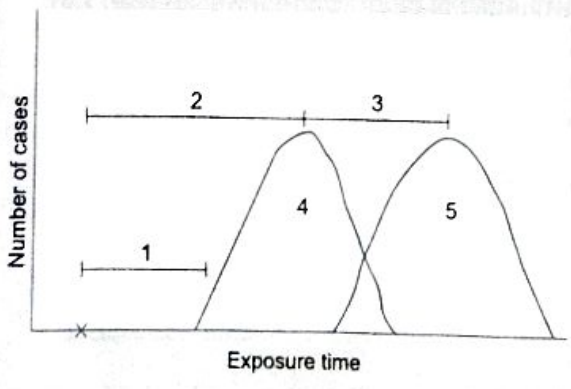

Fig. 7.7: Incubation period.

Q63. Median incubation period. *(TDMGRMU, 2012)*

Ans: It is the time required to 50% of cases to occur following exposure.

Q64. Generation time. *(TDMGRMU, 2009, 2013)*

Ans: It is a period between the onset of the infection and the maximum infectivity of the host. This period may be shorter than the incubation period in mumps and longer than the incubation period as in measles.

Q65. What is serial interval? *(RGUHS, 2002; TDMGRMU, 2009; RUJH, 2010; MGUB, 2024; VBUJH, 2023)*

Ans: It is a period between the onset of the first or index case and the secondary case. From a series of such secondary cases, the range of the incubation period of a particular disease can be assessed. Since the exact time of entry of the organism in the body cannot be known in practice, serial interval is used.

Q66. Injection safety is important for the recipient, provider and community—Justify. *(WBUHS, 2018; ABKUB, 2018; SMU, 2013; TRIU, 2024)*

Ans: As defined by the World Health Organization, a safe injection does not harm the recipient, does not expose the provider to any avoidable risks and does not result in waste that is dangerous for the community.

Practices that have resulted in transmission of blood-borne diseases include the following:

- Using the same syringe to administer medication to more than one patient
- Using the same medication vial for more than one patient, and accessing the vial with a syringe that has already been used to administer medication to a patient
- Using a common bag of saline or other IV fluid for more than one patient, and accessing the bag with a syringe that has already been used to flush a patient's catheter.

These incorrect practices put patients at risk for bacterial, fungal, and viral infections. Safe injection practices and appropriate aseptic technique are necessary to prevent bacterial and viral contamination of medication vials that can result in patient infections.

Needle recapping may injure self and that can cause harm to the injection provider. Some precautions should be followed so that the provider may not be affected.

- The waste thus produced should be properly disposed. Syringe, needles, ampoules, vials, blood soiled cotton swabs, etc., are potential source of infections.
- They should be properly disinfected, transported and disposed to reduce the harm of the community. HIV, hepatitis B and C virus, etc., are transmitted through these wastes and if proper care is not taken the community may be affected adversely.

From the above discussion, it can be resolved that injection safety is an important healthcare issue. Injection without safety can cause harm individual susceptible person or patient, injection providers and community at large.

This, injection safety is important for the recipient, provider and community.

Q67. Methods (Types) of disinfection. *(TDMGRMU, 2010; SMU, 2012; NU, 2014; RGUHS, 2024)*

Ans: Methods (Types) of disinfection are of three types, they are as follows:

1. **Concurrent disinfection** *(SAMU, 2022; NU, 2015; SMU, 2009)*
   It is applied after the discharge of infectious material from the body of an infected person, or after the soiling of articles with such infectious discharges. Disease agents are destroyed as soon as it is released from the body thus halt further spread of the disease.
2. **Terminal disinfection:** It applied after the death of the patient from hospital or has ceased to be a source of infection. Terminal cleaning should be adequate, along with airing and sunning of the rooms, furniture and bedding.
3. **Precurrent (prophylactic) disinfection:** Disinfection of water by chloride, pasteurization of milk and hand washing may the examples of precurrent disinfection.

Difference between sterilization and disinfection: *(KIMS, 2023)*

Points of difference	Sterilization	Disinfection
Definition	It is the process of destruction only the vegetative forms of the bacteria but also their spores, fungal and viruses	It is the process of destruction and removal of pathogenic organism outside the body, usually inanimate objects, and not necessarily the spores and not necessarily all the microbes but reduction of their numbers to such a low level that is not harmful for health
Target	Vegetative forms and spores	All pathogenic organism
Process	More lethal	Less lethal
Outcome	Complete destruction of pathogenic organisms	Reduction in number to nonharmful level
Used method	Various methods used, such as heating, autoclaving, dying and filtration, etc.	Chemical used, such as phenol, cresol, bleaching powder, etc.

Q68. Sterilization and disinfection are not synonymous. *(WBUHS, 2017)*

Ans: Sterilization: Validated process used to render a product free of all form of microorganisms including bacterial spores. Sterilizer is the apparatus used to sterilize medical devices, equipment or supplies by direct exposure to the sterilizing agent.

Disinfection: Thermal or chemical destruction of pathogens and other types of microorganisms. Disinfection is less lethal than sterilization because it destroys most recognized pathogenic microorganisms but not necessarily all microbial forms (e.g., bacterial spores).

So, sterilization and disinfection are not synonymous.

CM7.6: Enumerate and evaluate the need of screening tests.

Q69. What is screening for disease? Enumerate types of "screening for disease". Describe the uses of screening for diseases, criteria for screening of diseases. *(WBUHS, 2008, 2018, 2022; ABKUB, 2005, 2010, 2017; AKUB, 2022; BNMUB, 2018, 2019; VKSUAB, 2019; SAMU, 2008, 2015, 2022; RGUHS, 2011, 2013; TDMGRMU, 2009, 2011; SSUHSA, 2010, 2016, 2017; TRIU, 2011, 2012; BUMP, 2009; SMU, 2012, 2013; KIMS, 2017; RUJH, 2011, 2012; DU, 2013, 2014, 2016; NU, 2015, 2016; MU, 2022; SDVPG, 2023; GOAU, 2023)*

Ans: Definition of screening: Screening is the search for unrecognized disease or defect by means of rapidly applied tests, examinations or other procedures in apparently healthy individuals. Screening test may include history, clinical examination, laboratory investigation, radiological investigation, etc.

Q70a. The types of screening for disease. *(AKUB, 2022; BNMUB, 2012; RGUHS, 2012; TDMGRMU, 2012; KIMS, 2022; RUJH, 2023; GOAU, 2021; GNSUB, 2023; VBUJH, 2023; VNSGUS, 2023)*

Types	Description
Mass screening	Mass screening simply means the screening of the whole population or a subgroup, as for example all adults. It is offered to all, irrespective of the particular risk of an individual who may run of contracting the disease in question. Nobody will be exempted in this type of screening. **Example:** Tuberculosis
High-risk or selective screening	Screening will be most productive, if applied selectively to high-risk groups defined on the basis of epidemiological research. **Examples:** Cancer cervix tends to occur relatively less often in the upper social group. Screening for cancer cervix could increase the yield of new cases but screening of women of lower social class will surely yield greater number of cases. One population sub-groups for certain diseases, e.g., diabetes, hypertension and breast cancer.

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Types	Description
Multiphasic screening (WBUHS, 2018)	It has been defined as application of two or more screening tests in combination to a large population in different phases, for diagnosis of a single disease. **Examples:** The whole population of an area is screened by testing urine for sugar. Those who are positive for glycosuria are subjected for fasting blood glucose. Those who have FBS >126 mg/dL are subjected for oral glucose tolerance test (OGTT) to find out true diabetics.

Q70b. Uses of screening. *(WBUHS, 2017; SAMU, 2022; VBUJH, 2023; KIMS, 2023; VNSGUS, 2023)*

Uses	Description
Case detection	It may be defined as presumptive identification of unrecognized disease. Neonatal screening is one of the examples. Diseases identified by this method are breast cancer, cervical cancer, diabetes mellitus, iron deficiency anemia, pulmonary tuberculosis, etc. As the disease is detected early, treatment can be started early.
Control of disease	People are examined for the benefit of themselves and other population. Immigrants are screened for infectious diseases, such as tuberculosis and syphilis to protect home population. Thus, early diagnosis helps in appropriate treatment to halt disease transmission and thereby reduce mortality from diseases.
Research	The diseases, such as cancer and hypertension are screened to know the natural history of diseases. The initial screening will provide the prevalence of disease and thereafter it may estimate incidence. An informed consent is obtained before conducting the study that it will be done for research purposes and it is declared that follow up therapy will be available.
Educational purposes	Sometimes screening is done for creating awareness and for educating health professionals. Screening for diabetes mellitus is one of the examples.

Q70c. Criteria of screening of diseases. *(YSRUHSAP, 2023; SCVPG, 2023; MGUB, 2023; GOAU, 2023)*

Ans: Criteria for screening are based on two conditions. They are (1) criteria of the disease to be screened and (2) criteria of the test to be applied.

Criteria of screening of diseases. Elaborate the basis on which a disease is selected for screening? *(WBUHS, 2017, 2019, 2022; VNSGUS, 2023; MGUB, 2024)*

Criteria for screening are based on two conditions:

Sl. No.	Criteria of the disease to be screened
1.	The condition should be an important health problem
2.	There should be a recognizable latent or early asymptomatic stage
3.	The natural history of the condition, including development from latent to declared disease, should be adequately understood
4.	There is a test that can detect the disease, prior to onset of signs and symptoms
5.	Facilities should be available for confirmation of diagnosis
6.	There is an effective treatment
7.	There should be an agreed-on policy concerning whom to treat as patients
8.	There is good evidence, early detection and treatment reduces morbidity and mortality
9.	The expected benefits of early detection exceed the risks and costs

Q70d. Criteria of the test to be applied. *(MGUB, 2024)*

Criteria	Details
Acceptability	It is important that the test should be acceptable to the people at whom it is aimed. In general, the tests that are painful, discomforting or embarrassing (e.g., rectal or vaginal examination) are not likely to be acceptable to the population in mass campaign.

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Criteria	Details
Reliability of screening test *(DU, 2014)*	An attribute of an ideal screening test or any measurement (e.g., height, weight) is its reliability. (Sometimes called repeatability, precision or reproducibility). That is, the test must give consistent results when repeated more than once on the same individual or material, under the same condition. The reliability of the test depends on three major factors, namely, (a) observer variation (intraobserver or interobserver), (b) biological (subject) variation, and (c) errors relating to technical methods.
Validity	Validity has two components—sensitivity and specificity. **Sensitivity:** Ability of the test to identify correctly all those who have the disease (True positive) **Specificity:** Ability of the test to identify correctly all those who do not have the disease (True negatives) **Predictive value of a positive test** **Predictive value of a negative test**

Q70e. Validity (Criteria for validity of screening test). *(AFUH, 2022; BNMUB, 2010; ABKUB, 2022; RGUHS, 2009; TDMGRMU, 2014; SMU, 2013, 2014; DU, 2014; MU, 2019)*

The term validity refers to what extent the test accurately measures which it purports to measure. In other words, validity expresses the ability of a test to separate or distinguish those who have the disease from those who do not. Validity has two components—sensitivity and specificity.

a. **Sensitivity:** Ability of the test to identify correctly all those who have the disease.

$$\textbf{Sensitivity} = \frac{\text{True positive}}{\text{True positive} + \text{False negative}} \times 100$$

b. **Specificity:** Ability of the test to identify correctly all those who do not have the disease.

$$\textbf{Specificity} = \frac{\text{True negative}}{\text{False positive} + \text{True negative}} \times 100$$

c. **Predictivity of screening test.** *(ABKUB, 2011, 2009; DU, 2010)*/**Positive predictive value depends on the prevalence of a disease.** *(WBUHS, 2019)*

$$\textbf{Predictive value of a positive test} = \frac{\text{True positive}}{\text{True positive} + \text{False positive}} \times 100$$

d. $$\textbf{Predictive value of a negative test} = \frac{\text{True negative}}{\text{False negative} + \text{True negative}} \times 100$$

In addition to sensitivity and specificity, the performance of a screening test is measured by predictive value, which reflects the diagnostic power of the test. The predictive accuracy depends on sensitivity, specificity and disease prevalence. The predictive value of a positive test indicates that patients with a **positive test results** have the disease in question. **The more prevalent a disease in a given population, the more accurate will be the predictive value of a positive screening test.**

Q71. Discuss the different measures to evaluate the screening test. *(BNMUB, 2014)*

Ans: The following measures are used to evaluate a screening test:

a. Sensitivity
b. Specificity
c. Predictive value of positive test
d. Predictive value of negative test

Discussed in detail in previous question.

Q72. How will you plan for cancer screening in your PHC area as MOI/C of PHC? *(SAMU, 2015; GOAU, 2023)*

Ans: I have been asked to plan cancer screening in PHC area where a population of about 30 thousand resides in usual situation. More specifically cervical cancer may be the candidate for screening. It is an ideal disease to be diagnosed early by screening because of the following favorable points.

a. It is preceded by a premalignant localized lesion, such as cervical tear, chronic cervicitis, erosion, etc.
b. It has a pre-invasive stage.
c. The site is accessible.
d. The lesion is localized for a fairly long time for 8–10 years.

Screening procedures:

Pap smear examination for exfoliative cytology: This procedure not only helps in early detection of case, but also prevents them from developing invasive cancer. The current policy is that all woman should undergo a Pap test regularly once in three years and also a thorough pelvic examination.

Sensitivity of the Pap test: It is the ability of the Pap test to identify correctly all those who have the disease. Pap smear test has a sensitivity of 80%. The percentage of false negative can be reduced by taking the smear correctly by expert pathologists.

Alternative screening procedures other than Pap test:

a. **Visual inspection with 5% acetic acid (VIA):** The present strategy is to screen the women using visual inspection after application of 5% acetic acid solution. Detection of well-defined opaque acetowhite lesion close to the squamocolumnar junction, well-defined circumorificial acetowhite lesion or dense acetowhitening of ulceroproliferative growth constitutes a positive visual inspection of acetic acid (VIA).
b. **Visual inspection with 5% acetic acid and magnification (VIAM)**
c. **Visual inspection post-application of Lugol's iodine (VILI)**
d. **Colposcopic examination of high-risk women**

Thus, the screening procedure is the main weapon for early detection of cancer, so that mortality rate can be reduced. The patients, who show some positive features on screening, can be referred to District Hospital for other diagnostic test. These patients are listed beforehand and will be sent in an organized way as per the capacity of the referred hospital. The management in District Hospital is planned in such a way that the treatment based on colposcopy is offered in the same visit.

Pap smear and biopsy are also done to ensure cytological and histopathological back up of the patients.

Plan of action for the screening procedure:

Situation analysis: Each PHC consists of 6 subcenters. On an average each subcenter caters a population of 5000 in plain land area. There will be about 160 eligible couples in 1000 population at the present birth rate. So, in each subcenter area, estimated eligible couples will be 800. Total eligible couples will be 4800 in the PHC area.

Objectives: We want to do a mass screening of all eligible couples in the PHC areas. First of all, we divide eligible couple based on 1000 population. So in a PHC area can be divided into 48 subdivided areas. We will conduct the screening activity for 48 days in 48 areas or multiple areas in a single time by various teams. By the later, process duration of work will be reduced. We shall take the help of AWW, TBA, ASHA workers, Panchayat members, other formal and informal leaders and other influential person of that particular area.

Methods: Eligible couples list will be prepared with the help of ASHA and ANM beforehand.

Intensive information, education and communication activities are required to sensitize the community about the significance of the disease and its early detection through screening. Interpersonal communication as well as mass communication through leaflet will be used for concentrating the eligible couple in mentioned area in mentioned time.

Evaluation: After completion of screening in certain duration, reports will be made and analyzed. The report will be sent to higher authority for data sharing and decision making for future activity.

Decision: If objectives are fulfilled the activity will be continued. This activity may be repeated every year to get better results in terms of detection of cancer cervix and complications could be minimized.

SHORT NOTES AND RELEVANT QUESTIONS

Q73. Screening and case finding are not synonymous—Explain. *(WBUHS, 2013, 2022)*

Screening means the search for unrecognized disease or defect by means of rapidly applied tests, examinations or other procedures among **apparently healthy individuals**. It can be applied to various types of diseases by history, clinical examination, radiological and biochemical investigations, etc. Screening is testing for infection or disease in populations or in individuals who are not seeking health care.

Example: Serological testing for AIDS virus in blood donors, neonatal screening, premarital screening for syphilis, etc., are examples of screening.

On the other hand, **case finding** means use of clinical and/or laboratory tests to detect disease in individuals seeking health care for some or other reasons.

Example: Use of VDRL test to detect syphilis in pregnant women. Thus, screening and case finding are not synonymous.

Q74. How does screening differ from diagnostic test? *(WBUHS, 2008, 2018, 2022; MGUB, 2022, 2023; BNMUB, 2022; AKUB, 2022; TRIU, 2012, 2024; SMU, 2012; SSUHSA, 2017; BUMS, 2009; RUJH, 2012; DU, 2014; NU, 2014, 2016; RUGHS, 2024; VNSGUS, 2023)*/**Screening and diagnostic test are not synonymous—Justify.** *(WBUHS, 2015, 2020; SSUHSA, 2023)*

Ans: **Screening** is the search for unrecognized disease or defect by means of rapidly applied tests, examinations or other procedures in apparently healthy individuals. Screening test may include history, clinical examination, laboratory investigation, radiological investigation, etc.

Diagnosis is made on one and single patient containing signs and symptoms through application of single or multiple tests. The person came with medical problem and wanted to know his/her condition.

Screening is different from diagnostic test in the following ways: *(KIMS, 2024; MGUB, 2024)*

Screening tests	*Diagnostic tests*
Done on apparently healthy individual.	Done on those with indications or sick.
Applied to groups.	Applied to single patient, many diseases are considered.
Test results are arbitrary and final.	Diagnosis is not final, but modified in light of new evidences; diagnosis is the sum of the all evidences.
Based on one criteria or cut-off point.	Based on evaluation of number of signs, symptoms, laboratory findings.
Less accurate.	More accurate.
Less expensive.	More expensive.
Not a basis for treatment.	Used as a basis for treatment.
The initiative comes from the investigator or agency providing care.	The initiative comes from the patient with a complaint.

Q75. Sentinel surveillance of disease is better than periodic mass screening—Explain. *(WBUHS, 2022)*

Ans: **Sentinel surveillance** is the method of identifying the missing cases and thereby supplementing the notified cases as no routine notification system can identify all cases of infection or disease. The sentinel data are extrapolated to the entire population to estimate the disease prevalence in the total population.

Advantage: Reporting biases are minimized and feedback of information to the providers is simplified.

Sentinel surveillance agencies could be set up by competent physician or institution in selected areas to report certain disease. This system would provide more valuable and detailed information than traditional notification system. These sentinel sites could be developed into a notification system which is less costly than developing and maintaining an ongoing notification system. Infectious disease and Beliaghata

General Hospital of Kolkata plays such a role as sentinel site for some infectious diseases, such as rabies, diphtheria, etc.

Mass screening simply means the screening the whole population or a subgroup, for example all adults. It is offered to all, irrespective of the particular risk, individual may run of contracting the disease in question. Tuberculosis may be considered here.

Periodic mass screening is useful preventive measure when it is backed up by suitable treatment that will reduce the duration of illness or alter its final outcome.

Mass screening may miss the person who has been newly infected without signs and symptoms and he/she may develop the disease very soon. Sentinel surveillance has the advantage of vigilance over population continuously. Continuous monitoring will help control the diseases in sentinel surveillance. This is better option for control of disease, identification of clustering of diseases to foretell the imminent epidemic in one of areas.

Qn: Significance of "true positive" value in screening test. *(KIMS, 2016)*

Ans: Different values are determined from **Table 7.2** given below:

Table 7.2: Screening test result by diagnosis.

	Diagnosis (Gold standard)		
Screening test	***Diseased***	***Not diseased***	***Total***
Positive	40 (a)	20 (b)	60
Negative	100 (c)	9840 (d)	9940
Total	140 (a+c)	9860 (b+d)	10000

True positives denote those individuals found positive on the screening test who have the condition or disorder being studied. It is expressed by the ward "a".

False negatives denote those individuals found negative on the screening test but who have the disease, expressed by the ward "c".

True positive = a/a + c = 40/140 = 28.5%

False negative = c/a + c = 100/140 = 71.4%

28.5% true positives and 71.4% marked false negatives in the screening test.

The lower the sensitivity, larger will be the number of false negatives.

Qn: Significance of "false positive" in screening test. *(WBUHS, 2016, 2017; BNMUB, 2002)*

Ans: False positive test result is an important problem of screening test **(Table 7.3)**. The term false positive means that patients who do not have the disease but test result is positive, expressed by the box "b" in the 2 × 2 contingency table.

Table 7.3: Screening test result by diagnosis.

	Diagnosis (gold standard)		
Screening test	***Diseased***	***Not diseased***	***Total***
Positive	80 (a)	40 (b)	120
Negative	200 (c)	19680 (d)	19880
Total	280 (a + c)	19720 (b + d)	20000

False positive rate of that screening test is = (b/b + d) × 100 = (40/19720) × 100 = 0.20%.

Problem of false positive test result: In this case, normal healthy people may be subjected to further diagnostic tests, at some inconvenience, discomfort, anxiety and expense until freedom from the disease is

established. Suppose if a non-cancerous patient is falsely diagnosed as cancer, it not only increases the cost of treatment, but also hampers the quality of life because of anxiety and stress.

A screening test with a high specificity will have few false positive. False positives not only burden the diagnostic facilities, but they also bring discredit to the screening program.

Q78. Interpretation of false negatives of a screening test. *(WBUHS 2020)*

Ans: False negative test result is an important problem of screening test. The term false negative means that patients who actually have the disease, but test result is negative expressed by the box "c" in the 2 × 2 contingency table **(Refer to Table 7.2)**.

False negative rate of that screening test is = (c/a + c) × 100 = (200/280) × 100 = 71.4%.

Problem of false negatives test result: It amounts to giving them a false reassurance. The patient with a false negative result might ignore the development of signs and symptoms and may postpone the treatment. This could be detrimental if the disease in question is a serious one and the screening test is unlikely to be repeated within a short period of time. A screening test, which is sensitive, has few false negatives. The lower the sensitivity, larger will be the number of false negatives.

Q79a. Describe sensitivity and specificity. *(AKUB, 2022; MGUB, 2022; BNMUB, 2016, 2017, 2018; RGUHS, 2011; SAMU, 2015; TDMGRMU, 2009; SSUHSA, 2013, 2021; ABKUB, 2018; SMU, 2010; KIMS, 2015, 2023; DU, 2015; NU, 2017; RUJH, 2009; GOAU, 2022; TRU, 2023)*

Please referred Q70e.

Q79b. Sensitivity and specificity of a screening test are inversely related—Justify. *(WBUHS, 2014, 2024; KIMS 2023)*

Ans: Sensitivity is the ability of a test to identify correctly all those who have the disease that is true positives. 90% sensitivity means the test can identify 90% of the diseased persons. 10% will remain negative.

Specificity is the ability of a test to identify correctly all those who do not have the disease that is true negatives. 90% specificity means the test can identify 90% non-diseased persons. 10% people will show positive results.

We can see the undernoted table of sensitivity and specificity of a 2-hour postprandial blood test for glucose for 70 true diabetic and 510 true non-diabetics at a different level of blood glucose. Calculation of sensitivity and specificity has been done somewhere else. If we decide to use the 2-hour post-prandial blood glucose level of 180 mg/100 ml. as an index of presence of diabetes mellitus, the sensitivity and specificity are 50.0% and 99.8% respectively.

Blood glucose level (mg/dL)	Sensitivity	Specificity
80	100.0	1.2
90	98.6	7.3
100	97.1	25.3
110	92.9	48.4
120	88.6	68.2
130	81.4	82.4
140	74.3	91.2
150	64.3	96.1
160	55.7	98.6
170	52.9	99.6
180	50.0	99.8
190	44.3	99.8
200	37.1	100.0

We can say that where sensitivity is low, but specificity is very high there if index level be 180 mg/dL for consideration of diabetes mellitus.

Now look at the whole table. Here we find that sensitivity increases in decreasing blood glucose level, but specificity decreases in the same order of blood glucose. So, from the above table, we can draw a conclusion that sensitivity and specificity are inversely related.

Q80. What is lead time in screening of a disease and its importance?

(WBUHS, 2017, 2021; RGUHS, 2002, 2009, 2024; TDMGRMU, 2012, 2014; TRIU, 2013; SMU, 2013; BUMP, 2008; SSUHSA, 2006; SAMU, 2016; AFUH, 2023; VNSGUS, 2023)

Screening apparently increase survival time. *(AKUB, 2023)*

Ans: Lead time is the length of time between the detection of the disease by screening procedure/test and detection of disease by clinical signs and symptoms. So exact meaning of lead time is the time interval between first possible point of detection of the disease by screening test and usual time of detection of the disease by traditional method.

In other way, it can be seen. For example, in some cancer, cervical cancer, usually symptoms appear around 40 years and die within a variable short period of time. It is possible to diagnose the disease at earlier period before the development of symptoms through screening. If the mother is screened at 35 years onward once in a year, we can say she will be diagnosed and will survive many more years after diagnosis. Thus, the screening will increase the survival time. This gain is called "**lead time**". Some action can be taken here to provide the patient a healthful life from the society **(Fig. 7.8)**.

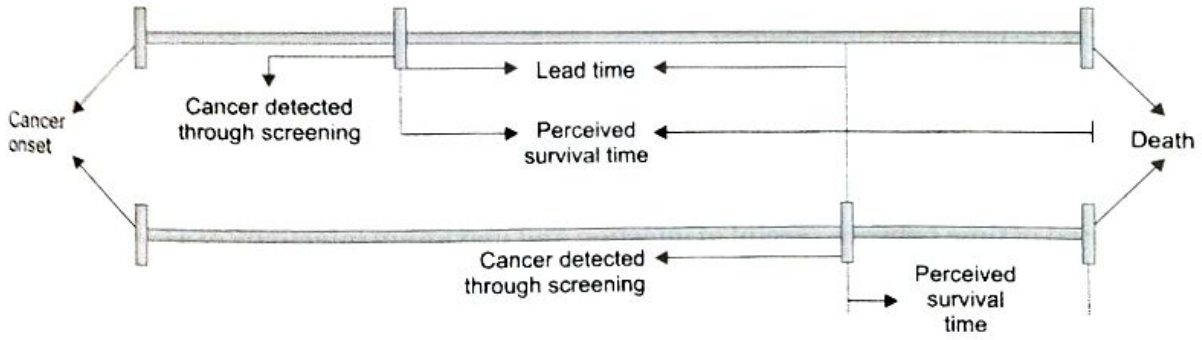


Fig. 7.8: Lead time in screening of disease.

MULTIPLE CHOICE QUESTIONS (MCQs)

GENERAL EPIDEMIOLOGY

1. **Father of epidemiology is:** *(ABKUB, 2014)*
   a. John Snow
   b. Hippocrates
   c. William Farr
   d. John Grant
2. **Epidemiological tried is:** *(ABKUB, 2014)*
   a. Agent, Vector, Host
   b. Vector, Carrier, Environment
   c. Agent, Host, Environment
   d. Agent, Environment, Treatment
3. **Epidemiological triad are all, *except*:** *(ABKUB, 2018; SSUHSA, 2023, 2024: TRIU, 2023; RUJH, 2023)*
   a. Host
   b. Environmental factors
   c. Agent
   d. Investigator/Manpower/Reservoir
4. **The measure of frequency in which the numerator is not a part of denominator is:** *(ABKUB, 2019)*
   a. Rate
   b. Ratio
   c. Incidence
   d. Mean

5. The epidemic disease act enacted in: *(YSRUHSAP, 2023)*

a. 1897 b. 1937
c. 1967 d. 2020

6. Index case is: *(AFUH, 2022)*

a. 1st detected case of the communicable disease in a community
b. 1st registered case by investigator
c. 1st treated case
d. 1st detected case developing after contact with primary case

7. What is an index case? *(ABKUH, 2023)*

a. 1st case of a communicable disease introduced into population unit
b. 1st case to come to the attention of the investigator
c. Developing from contact with primary case
d. None of the above

8. The very first step in investigation of an epidemic is: *(ABKUH, 2019)*

a. Confirmation of existence of an epidemic b. Verification of diagnosis
c. Development of epidemiological case sheet d. Formulation of hypothesis

9. In epidemic, 1st step is: *(ABKUH, 2018)*

a. Verification of diagnosis b. Isolation
c. Immunization d. Notification

10. The area is declared free of epidemic: *(ABKUH, 2014)*

a. Till last secondary case recovers
b. No new case was reported for the incubation period of the disease since last case
c. No new case was reported after twice the incubation period of the disease since last case
d. No new case was reported for six months since last case

11. The interval of time between receipt of infection and maximum infectivity of a host is: *(SAMU, 2015)*

a. Incubation period b. Serial interval
c. Generation time d. Communicable period

12. What is generation time of a disease? *(ABKUH, 2023)*

a. The time interval between invasion by an infectious agent and appearance of 1st sign or symptom of the disease
b. The period from disease initiation to disease detection
c. The interval of time between receipt of infection by a host and maximal infectivity of that host
d. The time during which an infectious agent may be transferred directly or indirectly from an infected person to another person, from an infected person to man, or from an infected person to an animal.

13. The interval of time between receipt of infection by host and maximum infectivity of thar host is: *(GITAMAP, 2023)*

a. Communicable period b. Second attack
c. Secondary attack rate d. Generation time

14. Time gap between onset of primary and secondary case is called: *(KIMS, 2015)*

a. Incubation period b. Lead time
c. Serial Interval d. Median incubation period

15. The ability of an infectious agent to invade and multiply in host is called: *(SAMU, 2015)*

a. Pathogenicity b. Infectivity
c. Virulence d. Communicability

16. **Chronic disease comprising all impairments, *except*:** *(SAMU, 2016)*
a. Are permanent
b. Do not leave residual disability
c. Are caused by non-reversible pathological alteration
d. Required special training for the patient for rehabilitation.

17. **There is a relation between high altitude and high prevalence of endemic goiter. This is an example of:** *(KIMS, 2015)*
a. Direct association
b. Indirect association
c. Spurious association
d. Causal association

18. **About direct standardization all of the following are true, *except*:** *(ABKUB, 2015)*
a. Age-specific death rates are not needed
b. A standard population is needed
c. Population should be comparable
d. Two populations are compared

19. **Rideal-Walker coefficient or carbolic coefficient is used for:** *(VKSUAB, 2021)*
a. Expressing efficiency of carbolic acid
b. Estimating efficiency of carbolic acid for disinfecting feces
c. Determining germicidal efficiency of a disinfectant in comparison to phenol
d. None of these

DESCRIPTIVE STUDY

20. **Descriptive epidemiological study designs can answer all of the following questions, *except*:**
a. Who b. When c. Where d. Why

21. **Which of the following verbs is used in the statement of objectives of a descriptive research study?**
a. Estimate b. Determine c. Examine d. Compare

22. **Which one of the following is useful to measure the burden or magnitude of a disease or risk factor?**
a. Case-control study
b. Cross-sectional study
c. Case report
d. Case series

23. **A cross-sectional descriptive study will give us:** *(ABKUB, 2019)*
a. Incidence rate
b. Prevalence
c. Relative risk
d. Odds ratio

24. **Characteristics of a cross-sectional study is that:**
a. We can calculate the incidence of disease
b. We can test a hypothesis
c. It is difficult to conduct
d. Exposure and outcome are assessed at the same time

25. **A spot map is used to describe:** *(ABKUB, 2019)*
a. Distribution according to person-related variables
b. Distribution according to place
c. Distribution according to time
d. None of the above

26. **One of the major limitations of a cross-sectional study is that:**
a. It is time consuming
b. It has lower validity
c. It does not establish disease etiology
d. It requires a large sample size

27. **Which of the following is false about cross-sectional studies?**
    a. Can be used to generate hypothesis
    b. Can be used to establish temporality of association
    c. Can be used to estimate disease burden
    d. Can be used to identify factors associated with outcome

28. **All the following are true about cross-sectional survey, except:**
    a. Individual is the unit of observation
    b. Involves only incident cases
    c. Estimate the burden of a disease
    d. It can be used to generate hypothesis

29. **Which of the following is a major limitation of a cross-sectional study compared to a cohort study?**
    a. Exposure and outcome are examined at the same time
    b. High attrition rate
    c. Expensive to conduct
    d. It takes a long time to complete

30. **Which of the following studies can be used to identify the factors associated with an outcome?**
    a. Descriptive cross-sectional study
    b. Analytical cross-sectional study
    c. Case study
    d. Case series

31. **Prevalence is:** *(ABKUB 2016)*
    a. Rate
    b. Ratio
    c. Proportion
    d. Mode

32. **When a new treatment is developed that delays deaths but does not produce recovery from a chronic disease. Which of the following will occur?** *(ABKUB 2020)*
    a. Prevalence of the disease will decrease
    b. Incidence of the disease will increase
    c. Prevalence of the disease will increase
    d. Incidence of the disease will decrease

33. **If P indicates prevalence, I indicates incidence and D indicates duration of illness, then the relationship between prevalence and incidence is expressed as:** *(ABKUB 2014)*
    a. $P = I \times D$
    b. $I = P \times D$
    c. $P = I/D$
    d. $P = I \div D$

34. **The relationship between incidence and prevalence can be expressed as:** *(ABKUB 2017 2020)*
    a. The product of incidence and mean duration of disease
    b. The dividend of incidence and mean duration of disease
    c. The sum of incidence and mean duration of disease
    d. The difference of incidence and mean duration of disease

35. **If prevalence is very low as compatible the incidence for disease, it implies:** *(AKUB 2022)*
    a. Disease is very fatal and/or easily curable
    b. Disease is non-fatal
    c. Calculation of prevalence and incidence is wrong
    d. Nothing can be said as they are independent

36. **Identify the correct statement:** *(ABKUB 2019)*
    a. Incidence is a rate while prevalence is a proportion
    b. Prevalence is a rate while incidence is a proportion
    c. Both incidence and prevalence are rates
    d. Both incidence and prevalence are proportions

37. **In a rural block with 1,00,000 population, 250 residents were identified with cardiovascular disease. Calculate the prevalence of cardiovascular disease per 1000 population.**
    a. 0.2
    b. 0.5
    c. 2.5
    d. 25

38. **Which of the following can decrease the prevalence of a disease?**
a. Increase in the incidence of the disease
b. Improved detection of diseased individuals
c. High case fatality
d. Immigration of persons with the disease into study area

39. **Which of the following conditions tends to reduce the prevalence of a particular disease?**
a. High cure rate
b. Low case fatality ratio
c. Improved case detection rate
d. Immigration of diseased people

40. **Which of the following is not required for calculating prevalence of a disease?**
a. Pre-existing cases of the disease
b. New cases of the disease
c. Total number of people at risk of developing the disease at that time
d. Total person-time of observation

41. **In which of the following conditions, prevalence is an appropriate measure of disease frequency?**
a. Common cold episodes in elderly
b. Number of exacerbations in asthma patients
c. Proportion of foot ulcers in diabetes mellitus
d. Number of diarrhea episodes in children

42. **What is the appropriate epidemiologic measure to determine the burden of a disease in terms of number of cases present in a specified geographical area at a specific point in time?**
a. Cumulative incidence
b. Point prevalence
c. Incidence rate
d. Case fatality ratio

43. **About 1000 prison inmates were followed up for one year to study the occurrence of tuberculosis (TB) among them. Of the total, 10 had TB at the beginning and another 25 persons developed TB during one year of follow-up. What is the period prevalence for that year?**
a. 2.5%
b. 3.0%
c. 3.5%
d. 4.0%

44. **Statistic used to estimate the risk of acquiring a disease:**
a. Prevalence
b. Incidence
c. Mortality rate
d. All of the above

45. _____ **is the most useful for evaluating the impact of prevention program.**
a. Point prevalence
b. Period prevalence
c. Case fatality
d. Incidence

46. **Which of the following statement is false about incidence of disease?**
a. It measures the rapidity with which new cases are occurring in a population
b. It is the number of all existing cases (new and old) during a given period in a specified population
c. It can be expressed as cumulative incidence or incidence density
d. Cumulative incidence is also referred to as attack rate

47. **Cumulative incidence is otherwise known as:**
a. Attack rate
b. Case fatality rate
c. Mortality rate
d. Morbidity rate

48. **The ratio of the number of new cases to the total time the population is at risk of disease refers to** _____:
a. Cumulative incidence
b. Incidence density
c. Risk
d. Incidence proportion

49. **Which of the following is true about incidence density?**
a. Numerator has number of new cases
b. Also called cumulative incidence
c. Denominator is number of persons at risk
d. Numerator has person-years at risk

50. In a study, 300 children were followed up for a period of one year to determine the burden of acute respiratory infections (ARI). Calculate the incidence density if the total number of ARI episodes recorded was 1500.

a. 5 episodes per child year
b. 0.2 episodes per child year
c. 3 episodes per child year
d. 0.5 episodes per child year

51. Which of the following is not a type of study design?

a. Qualitive study b. Observational study c. Retrospective study d. Translational study

52. Any systematic error in the design, conduct or analysis of a study that results in an erroneous estimate of an exposure's effect on the risk of disease is called:

a. Confounding b. Bias c. Interaction d. Stratification

53. What is another term used for random error?

a. Bias b. Chance c. Instrumental error d. Systemic error

54. What effect does increasing the sample size have upon the random error?

a. It increases the random error
b. It has no effect on random error
c. It reduces the random error
d. None of the above

55. Which of the following is true about case fatality?

a. It reflects the severity of the disease
b. It can be expressed as a rate
c. It cannot be expressed as a proportion
d. It expresses a relation between the number of deaths due to a disease to the total number of deaths

56. Which of the following is incorrect about case fatality?

a. It reflects the severity of a disease
b. High case fatality indicates poor prognosis
c. It relates the number of deaths to the number of cases of a disease
d. It is a true rate

57. Which of the following is not a systematic error in an epidemiological study?

a. Random error b. Confounding c. Selection bias d. Information bias

58. Which is a type of airborne transmission? *(ABKUB, 2023)*

a. Droplet infection b. Direct contact c. Droplet nuclei d. Fomites

59. The size of the particles which are implicated in the spread of air borne infection through droplet nuclei is: *(YSRUHSAP, 2023)*

a. 1–5 microns b. 1–10 microns c. 5 millimeters d. 10 millimeters

60. A disease affecting a large proportion of population in entire nation is called: *(YSRUHSAP, 2023)*

a. Epidemic b. Endemic c. Sporadic d. Pandemic

61. An example of a point source epidemic is: *(YSRUHSAP, 2023)*

a. Hepatitis A b. Poliomyelitis c. Water borne cholera d. Bhopal Gas Tragedy

62. Bhopal Gas Tragedy is example of: *(ABKUB, 2020; SSUHSA, 2023, 2024)*

a. Point source epidemic
b. Continuous epidemic
c. Propagated epidemic
d. Slow epidemic

63. If the number of deaths from tuberculosis is expressed in relation to the total mid-year population, it is: *(ABKUB, 2020)*

a. Case fatality rate
b. Age-specific death rate
c. Crude death rate
d. Cause-specific death rate

64. **Which of the following does not show seasonal fluctuations?** *(ABNUB, 2019)*
a. Malaria b. HIV infection c. Hay fever d. Meningitis

65. **Study of time, place and person distribution is:** *(ABKUB, 2020)*
a. Analytical epidemiology b. Experimental epidemiology
c. Descriptive epidemiology d. Observational epidemiology

66. **Disease in which herd immunity does not protect on individuals is:** *(ABKUB, 2020)*
a. Measles b. Tetanus c. Polio d. Diphtheria

67. **Cyclic trend is seen in:** *(ABKUB, 2015)*
a. Chickenpox b. Diphtheria c. Mumps d. Measles

68. **Which is not the true reason for cyclic trend of a disease?** *(ABKUB, 2016)*
a. Antigenic variation b. Build-up of susceptible
c. Herd immunity variation d. Environmental conditions

ANALYTICAL STUDY

69. **Which of the following verbs is preferably used in the statement of objectives of an analytical research study?**
a. Estimate b. Determine c. Study d. Describe

70. **Analytical study is used for _____.**
a. Testing of hypothesis b. Estimation of a parameter
c. Hypothesis formulation d. Describing a population

71. **The example of 'Analytical studies' in epidemiology are all, *except*:** *(ABKUB, 2014)*
a. Prospective study b. Retrospective study c. Case-control study d. Clinical trial

72. **Which is not an analytical study?** *(SAMU, 2015; AFUH, 2022)*
a. Case-control study b. Cohort study c. RCT d. Cross sectional study

73. **Comparison between two groups is the hallmark of:** *(ABKUB, 2019)*
a. Descriptive study b. Analytical study c. Both of the above d. None of the above

74. **All of the following are types of analytical studies, *except*:**
a. Case study b. Case-control study c. Experimental study d. Cohort study

75. **If there is a comparison group in an epidemiological study design, it is called:**
a. Descriptive b. Analytical c. Ecological d. None of the above

76. **What is the term used to denote "a small-scale study with minimal study participants which examines the feasibility of procedures intended to be performed in the main study"?**
a. Pilot study b. Pre-testing c. Case study d. Cohort study

CASE-CONTROL STUDY

77. **Case-control study is:** *(BNMUB, 2002, 2004)*
a. Longitudinal study b. Cross-sectional study c. Prospective study d. Retrospective study

78. **Which of the following study types is also known as prevalence study?** *(ABKUB, 2014)*
a. Longitudinal study b. Cross-sectional study c. Double-Blind study d. Case-control study

79. **The following are true about a case-control study, *except*:**
a. It is suitable for examining rare exposures
b. It can be completed in a shorter duration
c. It is relatively inexpensive to conduct
d. It is prone to information bias due to problems in recall

80. Which of the following is an element of a case-control study?

a. It starts with selection of study participants who are exposed
b. It involves matching of cases with controls
c. It includes randomization of cases and controls
d. It involves prospective follow up of the cases and controls

81. A study was conducted to determine the association between coronary artery disease and age-related macular degeneration in people aged 60 years or more. The investigators included 150 participants with age-related macular degeneration and 150 participants without age-related macular degeneration. The participants were interviewed for major risk factors for the disease. Among participants with age-related macular degeneration, 25 had history of coronary artery disease while among those without age-related macular degeneration, only 10 had history of coronary artery disease. Identify the study design in this case.

a. Cross-sectional study
b. Case-control study
c. Prospective cohort study
d. Experimental study

82. The following are true about a case-control control study, *except*:

a. Controls should represent the distribution of exposure in the source population
b. Controls are selected from the same source population that gave rise to the cases
c. Controls are selected depending on their exposure status
d. Controls can be selected from population or healthcare facility or from the neighborhood of cases

83. A researcher wants to determine the risk factors for Mucormycosis among patients who had COVID-19. Steroid usage was compared between patients who developed and those who did not develop Mucormycosis. This is an example of a _____.

a. Cohort study
b. Case-control study
c. Cross-sectional study
d. Retrospective study

84. Which among the following is an advantage of cohort study compared to a case-control study?

a. Incidence of the disease can be calculated
b. Less prone to loss to follow-up of participants
c. Less costly and less time-consuming
d. They are suitable for studying rare disease

85. All of the following are true regarding selection of participants in a case A study was conducted to determine the factors associated with malnutrition in under-5 children. The researcher screened 350 children from 25 randomly selected villages. Among them 150 children were either underweight and/or stunted. Socio-demographic characteristics, birth history, and childhood clinical history were recorded for the screened children. What is the type of the study design used here?

a. Descriptive cross-sectional study
b. Analytical cross-sectional study
c. Case-control study
d. Prospective cohort study

86. Prevalence ratio is the preferred measure of association in _____.

a. Analytical cross-sectional study
b. Cohort study
c. Case-control study
d. Descriptive cross-sectional study

87. Odds ratio of more than one indicates:

a. Odds of exposure among cases is lower than the odds of exposure among controls
b. Odds of exposure among cases is equal to the odds of exposure among controls
c. Odds of exposure among cases is higher than the odds of exposure among controls
d. Exposure is negatively associated with the disease

88. **What is true about confounders?**
a. They affect both study variable as well as outcome
b. Their effect can be minimized by proper study design and through stratified analysis
c. Both a and b
d. None of the above

89. **Confounding bias is reduced by all, *except*:** *(AKUB, 2022)*
a. Matching b. Blinding c. Randomization d. Multivariate analysis

90. **Smoking leads to esophageal carcinoma. Coffee intake has its effect on smoking and also esophageal carcinoma. This factor can distort the results of the study which intends to prove an association between smoking and esophageal carcinoma. This effect of this factor is known as:** *(ABKUB, 2020)*
a. Confounding b. Multiple causation
c. One to one relation d. Dose response relation

91. **Confounding is a form of which of the following errors?** *(ABKUB, 2019)*
a. Lack of internal validity (Bias) b. Lack of external validity
c. Lack of statistical precision d. Lack of repeatability

92. **Which of the following is not a method of dealing with confounding during the design stage?**
a. Restriction b. Stratification c. Matching d. Randomization

93. **In a cohort study to examine the association between obesity and cardiovascular disease, gender was suspected to be a confounder. Which of the following methods will help in examining the confounding effect due to gender?**
a. Matching b. Restriction
c. Randomization d. Multivariate regression

94. **A researcher planned a prospective study on healthy eating habits among adolescents. If the people who have healthy lifestyles and healthy behaviors were more likely to participate in the study, due to the proposed study method, what bias is likely to occur?**
a. Information bias b. Selection bias c. Measurement bias d. Confounding bias

95. **Missing data can result in which of the following?**
a. Selection bias b. Loss to follow up bias c. Information bias d. Volunteer bias

96. **What is the term used to denote 'Association between exposure and outcome among the study participants differs from the causal association in the population'?**
a. Errors in estimation b. Effect modification c. Precision d. Causal association

97. **Which of the following method can be used to control confounding at the analysis stage?**
a. Restriction b. Matching c. Stratification d. Randomization

98. **Which of the following is a method to deal with information bias?**
a. Repeated measurements on key variables b. Minimize non-response
c. Comparison of baseline variables d. Sensitivity analysis

99. **Which of the following is a method to deal with selection bias?**
a. Precise operation definition of variables b. Detailed measurement protocols
c. Training data collectors d. Apply same eligibility criteria across groups

100. **The annual report of POF hospital for the year 2006 shows 200 cases of myocardial infraction, 35 cases of cholecystitis, 105 cases of pneumonia and 350 cases of acute gastroenteritis. The results of this report cannot be generalized on the total population on account of:** *(ABKUB, 2020)*
a. Interview's bias b. Memory bias
c. Selection bias d. Berkson's bias

ECOLOGICAL STUDY

101. The analytical study where population is unit of study is: (ABKUB 2020)
a. Cross-sectional study b. Ecological study c. Case-centered study d. Cohort study

102. Population level information is required in which of the following study designs?
a. Case-control study
b. Ecological study
c. Randomized control trial
d. Cohort study

103. Population census can be classified under which of the following study design?
a. Cohort study b. Case-control study c. Cross-sectional study d. Ecological study

104. Advantage of an ecological study is that:
a. It is analytical in nature
b. It will be useful to test hypothesis
c. It will cover individual level information on risk factors and disease
d. It will be useful to generate hypothesis

105. Advantage of an ecological study is:
a. Relate rate of disease and exposure
b. Useful to test hypothesis
c. Useful to study rare diseases
d. All of the above

106. Which of the following statement is (are) referring an ecological study?
a. Individual is the unit of study
b. Relate the exposure and outcome at the population level
c. It is a detail description of a rare clinical condition of a specific disease
d. It is an interventional study

107. To determine the association between air pollution and male infertility, data on air quality index and prevalence of male infertility was collected for 183 countries for the year 2019. What best describes the study?
a. Case report b. Case series c. Ecological study d. Cross-sectional study

108. Which of the following is incorrect about ecological study?
a. It relates the rate of disease and frequency of exposure
b. It is an example of observational study
c. It uses individual level data
d. It helps in generating hypothesis

COHORT STUDY

109. What is an appropriate measure of statistical association in a cohort study?
a. Prevalence ratio
b. Risk ratio
c. Odds ratio
d. Pearson's correlation coefficient

110. Which of the following information about cohort study is incorrect?
a. Study population can be selected from the general population or subgroups
b. Exposure status of the participants is collected at the baseline
c. Individuals who had outcome of interest at the baseline will form the cohort
d. Follow-up and outcome ascertainment in the exposed and the unexposed groups should be uniform

111. All of the following are true about cohort study, *except*:
a. It is can be expensive and time consuming
b. It is appropriate for diseases with long latency period
c. Incidence of disease can be determined
d. Loss to follow up can introduce bias

112. **In a retrospective study, we find the history of:** *(ABKUB, 2019)*
a. Exposure among those having or not having the outcome
b. Outcome those having or not having the exposure
c. Both exposure and outcome at the same time
d. None of the above

113. **What is the type of study that uses only the information recorded in the past?**
a. Retrospective
b. Prospective
c. Randomized clinical trial
d. Retroprospective

114. **The smoking history of pregnant women is taken in the antenatal period and correlated with the birth weight at the time of delivery. To find an association between them would be an example of:** *(ABKUB, 2020)*
a. Clinical trial
b. Nested cohort study
c. Retrospective study
d. Prospective study

115. **Relative risk is calculated in:** *(SAMU, 2015; AFUH, 2022; VNSGUS, 2023)*
a. Cross-sectional study
b. Cohort study
c. Case-control study
d. None

116. **The ratio of the incidence of the disease (or death) among exposed and the incidence among non-exposure is:** *(YSRUHSAP, 2023)*
a. Odds ratio
b. Attributable risk
c. Relative risk
d. Population attributable risk

117. **Relative risk is a:**
a. Rate
b. Ratio
c. Proportion
d. None of the above

118. **All the following are elements of a cohort study, *except*:**
a. It involves calculation of incidence rate
b. It proceeds from exposure to outcome
c. It involves randomization of participants
d. It involves follow-up of the participants

119. **Which of the following statements about case-control/cohort studies is correct?**
a. Case-control study always establishes temporal association
b. Cohort study establishes temporal association
c. Cohort has lower level of evidence than case-control
d. Do case-control for rare exposures and cohort for rare disease

120. **To study the incidence of malaria, according to various age and sex groups, in a village, we need to undertake:** *(ABKUB, 2019)*
a. Descriptive study
b. Case-control study
c. Cohort study
d. Experimental study

121. **Which of the following is most useful in the generation of Public Health Policy?** *(ABKUB, 2014)*
a. Attributable risk
b. Odds ratio
c. Population attributable risk
d. Relative risk

CASE REPORT AND CASE SERIES

122. **A detailed presentation of a single case which is rare and unfamiliar, is called:**
a. Case report
b. Case series
c. Ecological study
d. Cross-sectional study

123. **Which of the following is not applicable in a case study?**
a. Clinical features
b. Laboratory parameters
c. Socio-demographic background
d. Incidence

124. **Case series are useful:**
a. To estimate burden of a disease
b. To determine risk factor of a disease
c. To determine efficacy of a new drug
d. To describe uncommon clinical manifestation

125. In a medical journal, 18 cases of Creutzfeldt-Jakob disease were reported from a tertiary care hospital in Sikkim. The authors of the paper gave a description of the socio-demographic, clinical, and laboratory features of the 18 patients. What best describes this study design?

a. Case study b. Case series c. Case-control study d. Ecological study

126. Which of the following study designs is most appropriate to disseminate information on rare clinical manifestation of a particular disease?

a. Case series b. Cross-sectional study c. Ecological study d. Case-control study

127. Findings from which of the following study designs is least generalizable to the population?

a. Case series b. Cross-sectional study c. Case-control study d. Cohort study

EXPERIMENTAL STUDY

128. In which of the following studies are the exposure and outcome variables studied at the same point of time? *(ABKUB, 2019)*

a. Case-control study
b. Cohort study
b. Cross sectional analytical study
d. Experimental study

129. Exposure is assigned by the investigator in which of the following epidemiological study?

a. Cross-sectional study b. Case-control study c. Experimental study d. Cohort

130. The following are a feature of randomized controlled trials, *except*:

a. Randomization
c. Allocation concealment
b. Simple random sampling
d. Blinding

131. All are true about randomized control trials, *except*: *(SAMU, 2016)*

a. Baseline characteristics of intervention and control groups must be similar
b. Investigator bias can be minimized by double blinding
c. The sample size depends on the hypothesis tested
d. Dropout should be excluded from the analysis

132. Another name for randomization is: *(ABKUB, 2019)*

a. Random sampling b. Random allocation c. Random error d. Random variable

133. In a randomized controlled trial, overly restrictive exclusion criteria may result in which of the following?

a. Decreased external validity
b. Decreased internal validity
c. Problems with recruitment
d. Both 'Decreased external validity' and 'Problems with recruitment'

134. Blinding in a randomized controlled trial addresses which of the following biases?

a. Ascertainment bias
c. Volunteer bias
b. Recall bias
d. Attrition bias

135. A pharmacologically inactive agent that investigators administer to participants in the control group of a randomized controlled trial is called as:

a. Comparator drug
c. Placebo
b. Conjugate
d. Drug under investigation

136. In a clinical trial of an investigational new drug, the participants were blinded to their treatment allocation. However, the investigators and data analysts were aware about the treatment allocation. Therefore, this randomized controlled trial would be considered as _____.

a. Double blinded
c. Single blinded
b. Triple blinded
d. None of the above

137. **Double-blinding in a clinical trial involves:**
a. Participants before and after study
b. Participants and investigators
c. Investigators and analysts
d. Participants and analysts

138. **In 'double blind' study:** *(ABKUB, 2014)*
a. Both observer and participant know the group allocation and treatment received
b. Observer knows the group allocation and treatment received but participant does not know
c. Neither observer nor participant knows the group allocation and treatment received
d. Participant knows the group allocation and treatment received but observer does not know.

139. **A new drug was introduced in some of patients to assess its usefulness compared with the old on neither patients nor clinicians who evaluated patients for effect under consideration in this clinical trial knew individual treatment assignments. This method of assignment is known as:** *(ABKUB, 2020)*
a. Single blinding b. Double blinding c. Triple blinding d. Randomization

140. **In a clinical trial, the study investigators compared a new analgesic with placebo for the control of pain in arthritis. The investigators and patients were not aware about the treatment assignment. What best describes this study design?**
a. Open-label RCT b. Single blind RCT c. Double blind RCT d. Triple blind RCT

141. **In a clinical trial conducted by the orthopedic department of a medical college in Kolkata, the investigators compared the wound healing time between conventional suturing technique and stapling technique for open fractures. The investigators, patients and data analysts were aware about the treatment assignment. What best describes this study design?**
a. Open-label RCT b. Single blind RCT c. Double blind RCT d. Triple blind RCT

142. **A research group from a medical college in Lucknow conducted a study to assess the efficacy of a new herbal medicine for the prevention of pneumonia in elderly. What type of randomized controlled trial is this study?**
a. Screening RCT b. Diagnostic RCT c. Therapeutic RCT d. Prophylactic RCT

143. **A research group from a medical college in Chandigarh conducted a study to assess the efficacy of a new vaccine for the prevention of COVID-19 among children. What type of randomized controlled trial is this study?**
a. Screening RCT b. Diagnostic RCT c. Therapeutic RCT d. Prophylactic RCT

144. **In which type of population is a phase-I vaccine trial conducted?**
a. Healthy volunteers b. High-risk group c. Diseased population d. Laboratory animals

145. **Long-term adverse effects and efficacy of a new drug can be tested in which of the following phases of a clinical trial?**
a. Phase 1 b. Phase 2 c. Phase 3 d. Phase 4

146. **Which of the following trials assesses effectiveness of a new vaccine?**
a. Phase 1 trial done in healthy volunteers
b. Phase 2 trial done in a susceptible population
c. Phase 3 trial done in healthy volunteers
d. Phase 3 trial done in a susceptible population

147. **Post-marketing surveillance is done in which of the clinical trial phases?**
a. Phase 1 b. Phase 2 c. Phase 3 d. Phase 4

148. **Which of the following is not an advantage of randomized controlled trials?**
a. Provides the highest level of evidence
b. Controls for selection and confounding bias
c. Establishes temporality of association
d. Entails minimal ethical issues

149. **A trial can be prematurely stopped if:**
a. A significant unanticipated risk is demonstrated
b. The investigators lose interest
c. The principal investigator retires
d. Minor adverse events are reported

150. Screening tests fall under which level of prevention? *(ABKUB, 2021; SSUHSA, 2020)*
a. Primary b. Primordial c. Secondary d. Tertiary

151. All are features of screening test, *except*: *(ABKUB, 2014)*
a. Test results are final
b. Result not a basis of treatment
c. Results of screening tests are very accurate
d. Applied to group of people

152. Sensitivity is: *(ABKUB, 2018; AFUH, 2022)*
a. True positive/true positive + false negative
b. True positive/false positive + true negative
c. True negative/false negative + false positive
d. True negative/false negative + true positive

153. The probability that a patient with a positive test result has the disease is: *(YSRUHSAP, 2023)*
a. Sensitivity
b. Predictive value of a positive test
c. Specificity
d. Predictive value of a negative test

154. The ability of test to detect correctly those who have the disease is: *(GITAMAP, 2023)*
a. Predictive accuracy b. Sensitivity c. Specificity d. Yield

155. Glucose tolerance test is a useful screening test for diabetes. The ability of the test to identify those who have the disease in question is called: *(ABKUB, 2020)*
a. Validity b. Specificity c. Reliability d. Sensitivity

156. Specificity is ability of a diagnostic test to detect: *(ABKUB, 2014)*
a. Negative result in those who have disease
b. Positive result in those who have disease
c. Negative result in those who have no disease
d. Positive result in those who have no disease

157. Specificity of a test means: *(BNMUB, 2005)*
a. Identifications of true positives
b. Identifications of true negatives
c. Identifications of predictive value
d. Identification of borderline

158. Screening test for specificity is the ability of a test to correctly identify: *(SAMU, 2016)*
a. False positives b. True positives c. True negatives d. False negatives

159. Predictive value of a screening test depends on: *(ABKUB, 2019)*
a. Prevalence b. Sensitivity c. Health worker d. None of the above

160. Advantage gained by timely instituted screening test is: *(KIMS, 2015)*
a. Generation time b. Screening time c. Lead time d. Serial interval

161. Not a part of national screening programmes: *(AKUB, 2022)*
a. Diabetes mellitus
b. Ca-cervix
c. Refractive errors
d. Dental caries

162. Lead time refers to the time between: *(AFUH, 2022)*
a. Disease onset and first critical diagnosis
b. Disease onset and first possible point of detection
c. First possible point of detection and final critical point
d. First possible point of detection and usual time of diagnosis

163. What is lead time? *(ABKUB, 2023)*
a. The period between diagnosis by early detection and diagnosis by other mean
b. The outcome to be expected when the disease is detected at the earliest possible moment
c. Determine both severity of disease and success of any treatment in reversing disease process
d. None of the above

164. **Incidence of disease is measured by:** *(TRIU, 2023)*
a. Case-control study b. Cohort study c. Cross-sectional study d. None of the above

165. **After having grand dinner in a hostel, a number of students were reported to be suffering from pain abdomen, diarrhea and vomiting. Most case occurred within 8 to 10 hours after dinner. This is an example of:** *(WBUHS, 2023)*
a. Common source single exposure epidemic b. Slow epidemic
c. Common source multiple exposure epidemic d. Propagated epidemic

166. **A doctor is required to study the incidence of "byssinosis" in a cotton textile industry. Which study design should he choose?** *(WBUHS, 2023)*
a. Cross sectional b. Longitudinal c. Ecological survey d. Case reports

167. **Doll and Hill are famous for their studies regarding:** *(MGUB, 2023, 2024)*
a. Framingham heart study b. Treatment of tuberculosis
c. Smoking and lung cancer d. Prevention of HIV

168. **Which one of the following is false about epidemic?** *(WBUHS, 2023)*
a. It is the unusual occurrence of a disease/health related states/events
b. It is frequency clearly exceeds the normal "expected occurrence"
c. It is occurrence crosses the "epidemic threshold" for that disease/health event
d. "Epidemic threshold" is two standard deviation from the epidemic frequency

169. **Which of the following is known as cross-product ratio?** *(MGUB, 2023, 2024)*
a. Relative risk b. Odds ratio
c. Attributable risk d. Population attributable risk

170. **All of the following are morbidity indicators, *except*:** *(SSUHSA, 2023)*
a. Prevalence b. OPD attendance rate c. Discharge rate d. Doctor-population ratio

171. **Specificity of a screening test was found to be 80%. Specificity is the ability of the test to detect:** *(WBUHS, 2023)*
a. Negative result in those who have the disease
b. Positive result in those who have the disease
c. Negative results in those who have no disease
d. Positive result in those who have no disease

172. **In a community survey, it is found that the prevalence of a disease has been increased from value determined by a baseline study. What attribute of a screening test is likely to be affected most?** *(WBUHS, 2023)*
a. Specificity b. Sensitivity
c. Positive predictive value d. Negative predictive value

173. **A survey is being planned to be conducted in Urban Health Training Centre (UHTC) of a medical college. In preparatory phase, the investigators are discussing to control the interobserver error. Finally, they decided to reduce it by all of the following methods, *except*:** *(WBUHS, 2023)*
a. Repeating measurement over time
b. Standardization of procedure of measurement
c. Stringent training of surveyors
d. Using two or more observers for independent assessment

174. **Epidemiologist are men in search of:** *(KIMS, 2023)*
a. Etiology b. Hypothesis c. Population d. Denominator

175. A condition, quality or attribute, the presence of which increases the chances of an individual to have develop or adversely affected by a disease process is known as: *(MGUB, 2024)*

a. Predisposing factor
b. Risk factor
c. Precipitating factor
d. Risk marker

176. Association of high-altitude areas with goiter is the example of: *(ABKUB, 2023)*

a. Causal association
b. Direct association
c. Temporal association
d. Indirect association

177. All of the following are the morbidity indicators *except*: *(WBUHS, 2023)*

a. Incidence
b. Attendance rate at OPD
c. Expectation of life
d. Admission rate

178. Which of the following statement is correct? *(SSUHSA, 2024)*

a. Numerator is a part of denominator in rate
b. Numerator is a part of denominator in ratio
c. Numerator is not a part of denominator in proportion
d. None of the above

179. If a new drug is preventing the mortality from a disease, but does not affect the cure, then which of the following about the disease is true? *(AKUB, 2024)*

a. Incidence will increase
b. Incidence will decrease
c. Revalence will decrease
d. Prevalence will increase

180. Doctor is required to study the incidence of silicosis in a stone-cutting industry. Which study design should be choose? *(TRIU, 2023)*

a. Longitudinal
b. Cross-sectional
c. Cological
d. Case series report

181. The numerator is not a component of denominator in case of: *(TRIU, 2024)*

a. Rate
b. Ratio
c. Proportion
d. None of the above

182. Which among the following is not an advantage of case-control study? *(TRIU, 2024)*

a. Requires comparatively few subjects
b. No risk of subjects
c. Risk ratio can not be identified
d. No attrition problem

183. Matching should be done in case-control study to: *(GNSUB, 2023)*

a. Reduce bias
b. To reduce sample size
c. Both of the above
d. None of the above

184. Nested case-control study is a type of: *(VBUJH, 2023)*

a. Retrospective study
b. Prospective study
c. Descriptive study
d. Cross-sectional study

185. A study was conducted to find relation between COPD and smoking. Patient data was collected through records from Govt. Hospital and record of cigarette sale from finance and taxation department. What is the type of study design? *(AFUH, 2023)*

a. Cross-sectional study
b. Cohort study
c. Ecological study
d. Randomized Control Trial

186. A village affected with epidemic of cholera, what is the 1st step should be taken in village to decrease the death from cholera? *(VBUJH, 2023)*

a. Safe water supply and sanitation
b. Cholera vaccination to all individuals
c. Primary chemoprophylaxis
d. Treat everyone in the village with Tetracycline

187. **During investigation of a food poisoning outbreak:** *(ABKUB, 2023)*
a. Only the affected persons are interviewed
b. Only not affected persons are interviewed
c. Both affected and not affected persons are interviewed
d. Only hospitalized patients are interviewed

188. **A village has 100 under-five children. The coverage of measles vaccine is 60%. Following a measles case 26 children developed measles. The secondary attack rate is:** *(VBUJH, 2023)*
a. 25% b. 40% c. 50% d. 65%

189. **Trend of disease over time is best depicted by:** *(WBUHS, 2023)*
a. Bar diagram b. Venn diagram c. Line diagram d. Histogram

190. **There has been a gradual increase in number of cases of noncommunicable diseases as compared to previous years. This trend is called:** *(AFUH, 2023)*
a. Secular b. Cyclical c. Seasonal d. Periodical

191. **Secular trend is best demonstrated by:** *(GOAU, 2023)*
a. Line diagram b. Bar diagram c. Pie-chart d. Forest plot

192. **Influenza pandemic occurs after every 7–10 years. This kind of disease distribution in time is known as:** *(VNSGUS, 2023)*
a. Secular trend
b. Short time fluctuation
c. Cyclical trend
d. Seasonal trend
e. Endimicity

193. **In an outbreak of cholera in a village of 2000 population, 20 cases have occurred and 5 died. Case fatality rate is:** *(VNSGUS, 2023; AKUB, 2024)*
a. 1%
b. 0.25%
c. 5%
d. 25%
e. 0.025%

194. **Case fatality ratio (CFR) is a reasonably good measure of:** *(VNSGUS, 2023)*
a. Pathogenicity b. Infectivity c. Virulence d. Infectiousness

195. **Which of the following is not the analytical study?** *(RUHS, 2024)*
a. Cross-sectional study
b. Case-control study
c. Cohort study
d. Prevalence study

196. **Incidence rate is calculated from:** *(ABKUB, 2023)*
a. Case-control study
b. Prospective study
c. Retrospective study
d. RCT

197. **1st case that comes to notice of Investigator/Physician is:** *(VBUJH, 2023; AKUB, 2023; TRIU, 2024)*
a. Primary case
b. Secondary case
c. Index case
d. Refer case

198. **Identify the correct statement:** *(DBRAUA, 2024)*
a. Incidence is a rate while prevalence is a proportion
b. Prevalence is a rate while incidence is a proportion
c. Both incidence and prevalence are rates
d. Both incidence and prevalence are proportions

199. **Epidemiological chain of infection usually involves all of the following factors *except*:** *(DBRAUA, 2024)*
a. Disinfectant b. Infectious agent c. Human host d. Modes of transmission

200. Which of the following is retrospective study? *(DBRAUA, 2024)*
a. Cohort study b. Case-control study c. Cross-sectional study d. None of the above

201. Cross product ratio/Odds ratio is calculated from: *(VNSGUS, 2023; KIMS, 2019)*
a. Cohort study b. Case-control study c. Cross-sectional study d. Ecological study

202. Rideal-Walker Coefficient is employed in the assessment of: *(VBUJH, 2023)*
a. Effect of autoclaving
b. Sufficiency of pasteurization
c. Effect of incineration
d. Germicidal power of a disinfectant

203. All the following are criteria of a good disinfectant, *except*: *(ABKUB, 2023)*
a. It must destroy the pathogenic organism
b. It must not be toxic to humans and domestic animals
c. It can be costly
d. It must be amenable to detection by practical, rapid and simple analytic techniques
e. It must possess the property of leaving residual concentrations to deal with possible recontamination.

204. Which cancer screened by Pap smear? *(RUJH, 2023)*
a. Breast Cancer b. Esophageal cancer c. Cancer cervix d. Renal Cancer

205. If you have resources to do one PAP smear in women in an area, at what age it should be done? *(KIMS, 2019)*
a. 25–35 b. 35–45 c. 45–55 d. 55–65

206. Thermal screening at airports is a: *(AFUH, 2023)*
a. Prospective screen b. Prospective screening
c. Diagnostic screening d. It is not a screening procedure at all

207. Postpredictive value is most effected by: *(VNSGUS, 2023)*
a. Sensitivity b. Prevalence c. Specificity d. Relative risk

208. Population based screening of >30 years of age is done for all of the following NCDs, *except*: *(SSUHSA, 2024)*
a. Cervical cancer b. Diabetes mellitus c. Stroke d. Hypertension

Answers:

1.	a	**2.**	c	**3.**	d	**4.**	b	**5.**	a	**6.**	b	**7.**	b	**8.**	b	**9.**	a	**10.**	c
11.	c	**12.**	c	**13.**	d	**14.**	c	**15.**	b	**16.**	b	**17.**	b	**18.**	a	**19.**	c	**20.**	d
21.	a	**22.**	b	**23.**	b	**24.**	d	**25.**	b	**26.**	c	**27.**	b	**28.**	b	**29.**	a	**30.**	b
31.	c	**32.**	c	**33.**	a	**34.**	a	**35.**	a	**36.**	a	**37.**	c	**38.**	c	**39.**	a	**40.**	d
41.	c	**42.**	b	**43.**	c	**44.**	b	**45.**	d	**46.**	b	**47.**	a	**48.**	a	**49.**	a	**50.**	d
51.	d	**52.**	b	**53.**	b	**54.**	c	**55.**	a	**56.**	d	**57.**	a	**58.**	c	**59.**	b	**60.**	a
61.	d	**62.**	a	**63.**	d	**64.**	b	**65.**	c	**66.**	d	**67.**	d	**68.**	c	**69.**	b	**70.**	a
71.	d	**72.**	c	**73.**	b	**74.**	a	**75.**	b	**76.**	a	**77.**	d	**78.**	b	**79.**	a	**80.**	b
81.	b	**82.**	c	**83.**	b	**84.**	a	**85.**	b	**86.**	a	**87.**	c	**88.**	c	**89.**	b	**90.**	a
91.	a	**92.**	b	**93.**	d	**94.**	b	**95.**	a	**96.**	a	**97.**	c	**98.**	a	**99.**	d	**100.**	d
101.	b	**102.**	b	**103.**	d	**104.**	d	**105.**	a	**106.**	b	**107.**	c	**108.**	c	**109.**	b	**110.**	c
111.	b	**112.**	d	**113.**	a	**114.**	d	**115.**	b	**116.**	c	**117.**	b	**118.**	c	**119.**	b	**120.**	c
121.	c	**122.**	a	**123.**	d	**124.**	d	**125.**	b	**126.**	a	**127.**	a	**128.**	d	**129.**	c	**130.**	b

131.	c	132.	b	133.	c	134.	a	135.	c	136.	c	137.	b	138.	c	139.	b	140.	c
141.	a	142.	d	143.	c	144.	a	145.	b	146.	d	147.	d	148.	d	149.	a	150.	c
151.	a	152.	a	153.	a	154.	b	155.	d	156.	c	157.	b	158.	c	159.	a	160.	c
161.	d	162.	d	163.	a	164.	b	165.	a	166.	b	167.	c	168.	d	169.	b	170.	d
171.	c	172.	c	173.	d	174.	b	175.	a	176.	d	177.	c	178.	a	179.	d	180.	a
181.	b	182.	d	183.	a	184.	a	185.	c	186.	a	187.	c	188.	d	189.	c	190.	a
191.	a	192.	c	193.	d	194.	c	195.	d	196.	b	197.	c	198.	c	199.	a	200.	b
201.	b	202.	d	203.	c	204.	c	205.	c	206.	c	207.	b	208.	c				

FILL IN THE BLANKS

1. Types of prevalence are _____ *(SAMU, 2012)*
2. Food poisoning is a _____ epidemic *(KIMS, 2016)*
3. Disease frequency measured over a period of several years or decades is called _____ trend *(KIMS 2014)*
4. In case of _____ study, we proceed from effect to cause *(KIMS, 2015)*
5. Odds ratio can be calculated from _____ *(KIMS, 2014)*
6. Measures of the strength of association between risk factor and outcome is called _____ (Bias/Risk ratio/Randomization/Odds ratio) *(KIMS, 2019)*
7. The first case that comes to the attention of investigator is _____ *(SAMU, 2012)*
8. The number of exposed persons developing the disease within the range of the incubation period following the exposure to the primary case is called _____. [Total exposed persons will act as denominator.] *(KIMS, 2015)*
9. Zooanthroponosis is an infection transmitted from _____ to _____ *(VKSUAB, 2016)*
10. Diseases which naturally transmitted between vertebrate animals and man are called _____ *(KIMS, 2014)*
11. When disease agent undergoes only development, but no multiplication within vector, that type of biological transmission is called _____ *(KIMS, 2014)*
12. The ability of a test to identify correctly all those who have the disease is called _____ *(KIMS, 2014)*
13. Ability of a test to identify true negatives is called _____ *(SAMU, 2012, 2015)*
14. Analytic study with population as a unit of study is _____ *(MU, 2024)*
15. In a village with a population of 5000. 10 out of 50 diseased people died. Case fatality rate is _____ *(MU, 2024)*

Answers:

1. Point prevalence and period prevalence
2. Point source single exposure
3. Long-term or secular
4. Case-control
5. Case-control study

6. Odds ratio
7. Index case
8. Secondary attack rate
9. Man to vertebrate animals
10. Zoonoses
11. Cyclodevelopmental transmission
12. Sensitivity
13. Specificity
14. Ecological study
15. 20%

TRUE/FALSE

1. Mid-year population of a community is chosen on first of July of a year. (SAMU 20
2. Cross-sectional study finds the incidence of disease. (SAMU 20
3. An agent that destroys microorganisms especially pathogenic organisms called antiseptic. (SAMU 20
4. The first case that comes under the notice of investigation, is index case. (SAMU 20
5. Bias can be eliminated by blinding. (SAMU 20
6. Epidemic does not occur in postdisaster period is leptospirosis. (SAMU 20
7. PAP smear is a screening test for cancer cervix. (SAMU 20

Answers:

1. True
2. False
3. True
4. True
5. True
6. False
7. True

CHAPTER 8

Epidemiology of Communicable and Noncommunicable Diseases

CM8.5: Describe and discuss the principles of planning, implementing and evaluating control measures for disease at community level bearing in mind the public health importance of the disease.

Planning is the process of defining community health problems, identifying needs and resources, establishing priority problems, designing strategies, and administrative actions to accomplish the goals and objectives.

KEY PRINCIPLES OF PLANNING

Step 1 Assess burden of communicable and noncommunicable diseases and other problems.
Burden of disease is assessed in terms of incidence, prevalence, mortality, disability and loss of DALYs. This information is available through statistics of health facilities, household surveys, national family health survey, different disease surveillance program, disease registers and SRS data. For example, in India, 33% DALYs loss from communicable, maternal, neonatal and nutritional diseases, 55% from noncommunicable diseases and 12% from injuries in 2016 *(ICMR, PHFI and IHME 2017)*.

Step 2 Situation analysis: Where are we now?
For this, information collected from household surveys/National family health surveys and other secondary sources, etc. These compiled data will provide us ideas of where the area/block/district/state stands with respect to key program indicators (baseline data).

Step 3 Goals and objectives: Where do we wish to go?
To reduce the burden of disease in terms of incidence, prevalence, deaths (mortality) and disability and their risk factors.

- Elimination and eradication of disease is the ultimate goal.
- Objective should be prefixed to achieve by a specific period of time. The objectives should be fixed up in comparison with district or state or country figure.

Examples of specific objectives:

- To reduce prevalence of anemia by 3% point per annum
- To reduce stunting, wasting and low birth weight by 2% per annum
- 25% reduction of overall mortality from noncommunicable diseases by 2025
- To reduction of neonatal, infant, child and maternal mortality to 16, 28, 23, 70 by 2030
- 90% reduction of new HIV infections by 2030 as compared to base year 2010
- 80% reduction of TB incidence from 211 per lakh in 2015 to 43 per lakh by 2025
- 90% reduction of TB mortality from 32 per lakh to 3 per lakh by 2025
- To eliminate leprosy in the country by 2020, i.e., <1 case per 10,000 population in all districts of India.
- Eliminate malaria from India by 2030

Step 4 Identify resources:
Resources should be assessed with a balance of what is required and what is available. **Resources can be divided in manpower, materials and money (finance).**

- **Manpower:** Adequate human resources for health as per Indian Public Health Standards. BMOH/MO-IC, Medical Officers, Block Public Health Nurse (BPHN), Public Health Nurse (PHN), Laboratory Technicians, Health Supervisors, Multipurpose Health Workers (female), Second Auxiliary Nurse Midwife (ANM) are government functionaries. ASHA, Anganwadi Worker (AWW), CHG, Link workers are a few voluntary workers who work for people's health. Their strength should be assessed for proper and smooth functioning in the affected area.
- **Material:** Necessary drugs like Cotrimoxazole tablet, Zinc tablet, IFA tablet (small), ORS, injectable antibiotics, albendazole, etc., are very important material to treat medical problem of infants. IV fluid, saline set, weight machine, growth chart, etc., are other supportive materials. Vaccines, diluents, auto-disable and disposable syringe, health education material, etc., are also required to provide health services to young children. These also should be assessed.
- **Money (finance):** Money is required to discharge all kinds of services. This money is required for the implementation of different strategies. If required, extra-money should be requested from higher authority. Contingency money is present to the custody of block office. That money will be utilized during the provision of delivery of the health services.

Step 5 **Fixing priorities:**

After problems identified by situation analysis, resource assessment and establishment of objectives, priority action should be chosen. Because problems are many but resource is scarce. From different problems one or two problems will be taken for action implementation.

Step 6 **Plan formulation:**

- Reduction of Under 5 morbidity and mortality and maternal mortality
- Reduction of malnutrition
- Safe water and basic sanitation
- Adoption of health lifestyles by population through behavior change communication
- National disease control/Elimination program
- Reduction of road traffic accidents and injuries

Step 7 **Implementation strategies:**

Intervention strategies have to be implemented through existing healthcare delivery systems by public health services as well as private providers and NGOs and other voluntary agencies. National strategy for comprehensive primary healthcare has been evolved and being implemented in phased manner in the country.

Workplan of activities: It is divided in the following activities:

- Time of initiation of activity
- Tentative duration as per specified activity
- Responsibility of persons/agencies
- Costing of each activity

Reporting system:

- Work plans are implemented at village, Sub-center, PHC, CHC and district level
- Information is collected, recorded, and reported in a standard format by health workers
- Female and ASHAs every month as monthly progress report
- Health supervisors and MO I/C review this report in the monthly meeting and also plan for proposed activities for next month.

Step 8 **Monitoring and evaluation: How do we know we are on the right track?**

Monitoring can be defined as a process of measuring, recording, collecting and analyzing data on actual implementation of the program and communicating it to program managers so that any deviations from the planned operations are detected. Diagnosis for the cause of deviation is carried out, and suitable corrective actions are taken.

Monitoring is done frequently (daily) during the implementation of the plan and is one of the manager's day to day responsibilities. It may be done by direct observation, discussions and reviewing statistics and reports. The performance indicators for CCDs and NCDs have been worked out under a national program. There is an in-built mechanism of monitoring and evaluation for all the national health strategies/programs.

Evaluation indicators are:

- Input
- Process
- Output

Besides indicators, performance standards for each indicator have been evolved to measure the gaps between actual and standard performance. Afterwards the performance gaps are identified subsequently corrective action could be undertaken.

Evaluation is the end stage of planning. Evaluation is primarily concerned with degree of achievement of program objectives.

CBME 3.1: Describe and discuss the epidemiological and control measures including the use of essential laboratory tests at the primary care level for communicable diseases.

Essential laboratory tests at the primary care level for communicable diseases:

Health facility	Essential laboratory tests done
Sub-center	Active case detection of malaria by ANM, ASHAs with bivalent antigen detecting RDTs
BPHC/CHC	• Blood for complete blood count, HIV1 and HIV2, syphilis, microscopic examination of discharge after Gram staining • For sputum examination of suspected tuberculosis cases, microscopic examination (Thick and thin film) for suspected malaria cases as well as rapid diagnostic test
District/Sub divisional Hospital	• Night blood examination for Filariasis if facilities available • IgG and IGM in suspected cases of Japanese encephalitis • IgG and IGM in suspected cases of Chikungunya fever • ELISA based NS1 (nonstructural protein 1) for up to 5 days of suspected Dengue cases and IgG and IGM after 5 days of fever • For Kala-azar fever more than 2 weeks rapid diagnostic test (rk-39 kit) • For leprosy skin smear by slit and scrape method • CBNAAT, RTPCR for diagnosis of Tuberculosis and COVID-19 respectively

CBME 3: Enumerate and describe disease specific National Health Programs including their prevention and treatment of a case (STI/RTI/HIV/AIDS, Rabies, Plague, Leprosy, Tuberculosis, Poliomyelitis, Yellow fever, Trachoma).

STI/RTI/STD/HIV/AIDS RELATED QUESTIONS AND ANSWERS

Q1. Discuss the epidemiology of AIDS. *(BNMUB, 2012; SAMU, 2011; RGUHS, 2012; DU, 2005; SSUHSA, 2018, 2021; ABKUB, 2018; KIMS, 2019)*

Ans: Epidemiology of AIDS:

AIDS is a fatal illness caused by human immunodeficiency virus (HIV).

- **Agent:** HIV is a retro virus. It can be converted from RNA to DNA. It is circular in shape. The virus has unique ability to destroy human T4 helper cells, a subset of human T-lymphocytes. The virus is able to spread throughout the body. There are two types of HIV—HIV 1 and HIV 2. HIV 1 is most common and is more virulent.
- **Reservoir of infection:** These are cases and carriers. Once the person is infected, the virus remains in the body life-long.
- **Source of infection:** The virus is found in greatest concentration in blood, semen and CSF. Lower concentration is found in tears, saliva, breast milk, urine, cervical and vaginal secretions.
- **Host factors:** Age: Mostly sexually active persons aged 20–49 years of age.

- **Sex:** It varies with region. But certain sexual practices increase the risk of infection, e.g., multiple sexual partners, anal intercourse, male homosexuality. Higher rate of infection is found in prostitutes.
- **High-risk groups:** Male homosexuals, heterosexual partners (including prostitutes and their partners), injectable drug users, transfusion recipients of blood and blood products, hemophiliacs and sexual partners.

Acquired immunodeficiency syndrome (AIDS) has emerged as one of the most serious public health problems in the country as the first case reported in 1986. The first HIV positive case was reported from Chennai and the first AIDS case was reported from Chennai. Initially, the cases were among commercial sex workers in Mumbai and Chennai and injectable drug users in Manipur. The disease is spread rapidly in the areas adjoining these epicenters. Currently, Tamil Nadu, Andhra Pradesh, Maharashtra and Manipur together account two thirds of total AIDS cases.

It is estimated that India had approximately 1.2 lakh new HIV infections in 2009, as against 2.7 lakh in the year 2000. Of the 1.2 lakh estimated new infections in 2009, the six high prevalence states account for 70% of cases, while the states of Orissa, Bihar, West Bengal, Uttar Pradesh, Rajasthan, Madhya Pradesh and Gujarat account for 41% of new infections.

In India in 2010-11, unprotected sex (88.7%) was found the main route of HIV transmission, Parent to child transmission (5.4%), use of infected blood and blood products 1.0%, injectable drug users 1.6% and others 3.3%.

Q2. Write in short about National AIDs Control Program along with National AIDS Control Organization (NACO). *(ABKUB, 2007; TRIU, 2014, 2016; BNMUB, 2016; SSUHSA, 2018)*

Ans: National AIDs Control Program (NACP) was launched in the year 1987. The aim of the program is to prevent further transmission of HIV, to decrease morbidity and mortality associated with HIV infection and to minimize the socio-economic impact resulting from HIV infection.

The milestones of the program are described below:

- 1986—1st case of HIV detected, AIDS task force set up by the ICMR, and National AIDS Committee established under the Ministry of Health.
- 1990—Medium term plan launch for 4 metro cities
- 1992—NACP-I launched to slow down the spread of HIV infection, National AIDS Control Board was constituted. Subsequently, National AIDS Control Organization was established.
- 1999—NACP-II begins, focusing on behavior change, increased decentralization and involvement of NGOs. State AIDS control societies established.
- 2002—National AIDS control policy adopted, National blood policy adopted.
- 2004—Antiretroviral treatment initiated.
- 2006—National council on AIDS constituted under chairmanship of the Prime Minister, National Policy on Pediatric ART formulated.
- 2007—NACP-III was launched for 5 years (2007–2012)
- 2012—NACP-IV was launched for 5 years (2012–2017). It was subsequently extended for the period 2017–2021.

A **mid-term appraisal (MTA)** was done in 2016, based on which the National Strategic Plan for HIV/AIDS and sexually transmitted infection (STI) 2017–2024 was launch.

The NACP has been implemented by GOI as 100% centrally sponsored scheme through State AIDS Control Societies (SACS) in the states with the following **goals and objectives:**

- Reduce new infections by 50% (2007 Baseline of NACP-III)
- Provide comprehensive care and support to all persons living with HIV/AIDS and treatment services for all those who require it.

Key recommendations of the MTA were:

- Adapt targeted intervention (TI) strategies to match changing dynamics for core and bridge population
- Roll out new strategies such as community-based testing (CBT), population and geo-prioritization

- Strengthen STI Program management and target efforts towards elimination of parent-to-child transmission of syphilis
- Strengthen the functioning of National Blood Transfusion Council (NBTC) and State Blood Transfusion Council (SBTC)
- Consider revising the eligibility criteria for treatment initiation to CD4 500 and to introduce the test and treat strategy for key population (KP) and serodiscordant couples
- Strengthen Strategic Information Management System (SIMS)
- Target specific audience segments such as migrants and MSM for information, education and communication (IEC) activities
- Focus on institutional strengthening
- Streamline financial management
- Uplift procurement and supply chain functions

The MTA suggested some thrust areas for the remaining period. Based on these, a National Strategic Plan 2017–2024 was formulated in the last year of NACP-IV.

- **Central level:** National AIDS Control Organization (NACO) was established in 1992 as a completely separate wing under the department of health in New Delhi under Ministry of Health and Family Welfare, Government of India for effective implementation of the program in the whole country. It is under department of AIDS control since 2008.
  It is headed by Additional Secretary and Director General assisted by Joint Secretary, Technical Additional Directors and technical and administrative staff. All financial and administrative activities are performed by NACO. They are divided by divisions such as targeted intervention (TI); STI/RTI management; basic services, ICTC, PPTCT and TB and HIV coordination; blood safety; lab services; care support and treatment (CST); information, education and communication (IEC); strategic information (monitoring, evaluation, surveillance, research and data analysis) administration and procurement and finance. For effective program management, the decentralization process started during NACP-II with formation of societies in state and district levels.
- **State level:** State AIDS prevention and control societies (SAPCS) were established in each and every state of India for implementation of the program. SAPCS is headed by a Project Director (PD), who is either an IAS officer or senior medical officer from the state. Another additional Project Director position is there for looking after technical issue. One Joint Director, finance is looking after finance issues. Other components of the program are looked after by Joint and Assistant directors like STI/RTI management, CST, Blood safety, IEC, etc. Involvement of NGOs in some of the states in advocacy and funding, etc.
- **District level:** The District AIDS Prevention and Control Units (DAPCUs) have been established in 189 high priority (A and B category) districts spread across 22 states under NACP—III. District AIDS control officer is the head of DAPCU and also supported by district program manager and few other supported staff.

Q24. Discuss the various methods by which the disease can be prevented (package of services provided under NACP-IV). *(WBUHS, 2019; BNMUB, 2012, 2016; TRIU, 2021; RGUHS, 2012; SAMU, 2011, 2015; NU, 2016; SDVPG, 2023)*

Ans: AIDS can be prevented in the following ways: Package of services under NACP-IV are as follows:

A. **Prevention services:**
- Targeted interventions for high-risk groups (female sex workers, men who have sex with men, transgenders/hijras, injectable drug users) and bridge population (truckers and migrants)
- Needle-syringe exchange program (NSEP) and opioid substitution therapy (OST) for IUDs
- Prevention of interventions for migrant population at source, transit and destination.
- Link workers scheme for HRGs and vulnerable population in rural areas.
- Prevention and control of STI/RTI infections
- Blood safety
- HIV counseling and testing services

- Prevention of parent to child transmission
- Condom promotion
- Information, education and communication (IEC) and behavior change communication (BCC)
- Social mobilization, youth interventions and adolescent education program
- Mainstreaming HIV/AIDS response
- Workplace interventions

B. **Care, support and treatment services:**
- Laboratory services for CD4 testing and other investigations
- Free 1st and 2nd line antiretroviral treatment through ART centers and link ART centers, centers of excellence and ART plus centers
- Pediatric ART for children
- Early infant diagnosis for HIV exposed infants and children below 18 months
- Nutritional and psychological support through community care centers (CCC)
- HIV-TB coordination (cross referral, detection and treatment of co-infections)
- Treatment for opportunistic infections
- Drop-in-center for PLWHA (people living with HIV/AIDS)

C. **IEC services:**
- Communication programs—media campaigns, creative development campaigns and short films
- Helpline in national and state level
- Research and evaluation agency to assess costeffectiveness and program impact of BCC activities

D. **Capacity building:**
- Training
- Establish support and capacity strengthening
- Managing program implementation and contacts
- Mainstreaming/Private sector partnerships
- Project audit-external, internal and audit of NGOs

E. **Strategic management information system:**
- Training and implementation of SIMS
- Monitoring and evaluation
- Surveillance
- Research

Q3. Name common STDs. What measure is suggested for prevention and control with special reference to HIV/AIDS? *(GNSUB, 2022; BNMUB, 2005; ABKUB, 2010, 2018; BUMP, 2016, 2017; SMU, 2011, 2012; SAMU, 2011; DU, 2015; SSUHSA, 2017)*

Ans: The common STDs are Syphilis, Gonorrhea, Chancroid, Lymphogranuloma venereum (LGV) and Granuloma inguinale. Other STDs include Nongonococcal urethritis (NGU), Herpes progenitalis, Genital Warts, Trichomoniasis, Moniliasis, Scabies and Pediculosis pubis. Acquired immunodeficiency syndrome (AIDS) is now referred to as another STD. Causative agents of common STDsare enumerated below:

Name of the disease	*Name of the agent*
Syphilis	*Treponema pallidum*
Gonorrhea	*Neisseria gonorrhoeae*
Chancroid	*Haemophilus ducreyi*
Lymphogranuloma venereum	*Chlamydia trachomatis*
Granuloma inguinale	*Calymmatobacterium granulomatis*
Herpes progenitalis	Herpes simplex virus
Nongonococcal urethritis	*Gardnerella vaginalis*

Cont'd

Contd...

Name of the disease	Name of the agent
Genital warts	Human papilloma virus
Trichomoniasis	*Trichomonas vaginalis*
Moniliasis	*Candida albicans*
Scabies	*Sarcoptes scabiei*
Pediculosis pubis	*Pthirus pubis*
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)

Q.1. Syndromic management of STD is most appropriate approach in India–Justify.
(WBUHS, 2016, 2017; BNMUB, 2021; ABKUB, 2022; TRIU, 2021; GITAMAP, 2023; TDMGRMU, 2011; DU, 2003; SSUHSA, 2007, 2023; RUJH, 2009; SMU, 2010, 2014; NU, 2008; GOAU, 2023; GNSUB, 2023; SDVPG, 2023)

Ans: Syndromic approach is adapted by NACO as a primary strategy to control and prevent STI/RTIs.

A syndrome is a combination of symptoms (the presenting complaints of patients) and signs (the markers of infection in the patient observed by healthcare provider).

Why syndromic approach?

- STI/RTIs are caused by different microbes. It is difficult to identify each of them through laboratory examination, which is not only costly but also time consuming and not within reach of many patients.
- There is a possibility of having more than one STI at a time.
- To address all these issues, syndromic approach is adapted by NACO as a primary strategy to control and prevent STI/RTIs and treat the patient at first contact and thereby reduces secondary cases/infectiousness.

Syndromic management is a **scientific and proven approach** as it ensures **correct and complete treatment covering most common organisms** responsible for a particular syndrome and includes patient **education, counseling, partner treatment, follow-up and documentation and reporting** and where necessary performing basic laboratory tests.

The concept of early diagnosis: Currently HRG is visiting doctor 30–40 days after symptoms developed. It should be brought down to <3 days.

STI/RTI service delivery: NACO has branded the STI/RTI services as **"Suraksha Clinic"** and developed a communication strategy for generating demand for these services. The **signage** is provided in the hospital for easy identification of the beneficiaries. 07 (Seven) color coded kits are being used in syndromic management recommended by NACO.

Syndromic case management protocol:

Kit No.	Syndrome	Color	Contents of the kit
Kit 1	Urethral discharge (UD), anorectal discharge (ARD), cervicitis, painful scrotal swelling (PSS) and presumptive treatment (PT)	Gray	Tab Azithromycin 1 gm and Cefixime 400 mg, once, single dose each tablet stat
Kit 2	Vaginal discharge (VD)	Green	Tab Secnidazole 2 gm after meal and Fluconazole 150 mg used single dose each tablet stat
Kit 3	Nonherpetic genital ulcer disease (GUD-NH)	White	Inj Benzathine Penicillin (2.4 MU) once stat in divided doses in intramuscular in gluteal region both side and Tab Azithromycin 1 gm once stat after skin test for sensitivity
Kit 4	Nonherpetic genital ulcer disease (GUD) those patients are allergic to penicillin	Blue	Doxycycline 100 mg twice daily for 15 days and Azithromycin 1 gm once single dose
Kit 5	Herpetic genital ulcer disease (GUD-H)	Red	Tab Acyclovir 400 mg, three times daily for 7 days, total 21 tablets

Contd...

Contd...

Kit No.	Syndrome	Color	Contents of the kit
Kit 6	Lower abdominal pain/pelvic inflammatory disease (LAP/PID)	Yellow	Tab Cefixime 400 mg once stat, Doxycycline (100 mg) twice daily for 14 days and Metronidazole (400 mg) twice daily for 14 days
Kit 7	Inguinal bubo (IB)	Black	Tab Azithromycin 1 gm, once stat and Doxycycline 100 mg twice daily used for 21 days

Note: Follow-up after 7 days for all STI; 3, 7, 14 for LAP: 7, 14, and 21 days for IB.
If symptoms persist, assess whether it is due to reinfection and advise prompt referral. Consider immunization against hepatitis B.

Another group of STIs like Genital warts are also found. Two types of warts are treated in STI clinics and patients of complicated cases are referred to center like medical colleges.

Molluscum contagiosum: This type of warts found anywhere in body including genital area due to unsafe sexual practices. Usually, these are multiple, soft, painless, smooth, pearl like swellings discrete in nature.

Treatment: These are treated with 30% trichloro acetic acid (TCA) weekly until cure preferably for 7–10 weeks.

Condyloma lata: These can be single or multiple, soft painless growths which looks like cauliflower. They appear around anus and oral cavity in both man and women. These may also appear in vulva in women and penis on men.

Treatment: These are treated with 20% Podophyllin weekly until cure, preferably for 7–10 weeks. Condom promotion and its appropriate use are important aspects of prevention and control of HIV infection as well as STDs.

It is very important to note that for prevention of STDs as well as AIDS, appropriate use of condom in each and every sexual activity. In this respect, we have to remember 3 "C" and C-condom use, C-consistent use and C-correct use.

Another important area in this respect. STDs also facilitate the acquisition and transmission of HIV infection. In the presence of genital ulcer, the risk of transmission of HIV is up to **10 times** and presence of genital discharge it is **5 times**. **From the above statement, it is revealed that Genital Ulcer and Discharge should be treated very promptly.**

Q5. Discuss the role of (Pretest and Post-test) counseling in controlling HIV/AIDS, write on VCTC/ICTC and sentinel surveillance in prevention of HIV/AIDS. *(WBUHS, 2010; ABKUB, 2009; TRIU, 2022; SAMU, 2004; BNMUB, 2006; RGUHS, 2008; NU, 2015)*

Ans: Counseling: Counseling is face-to-face communication by which counselor can help the person/client make decisions and act on them. Its main aim is to solving problem. The counselor should be skillful, communicative, knowledgeable, cooperative, empathic, maintaining confidentiality, good listener, non-commanding attitude. Pre and post-test counseling playing an important role for prevention of HIV/AIDS.

Objectives: Counseling before test **(Pretest)** prepares the clients for undergoing test and changing his/her high-risk behavior whereas counseling after the test result **(Post-test)** prepares the client to understand the meaning of positive and negative test.

The meaning of **VCTC** is voluntary counseling and testing centre. This involves increasing availability and demand for voluntary testing, training of grass root level healthcare workers in HIV/AIDS counseling and providing counseling services through all blood banks in India and through STI clinics. VCTC established in each district hospitals of the all states and few designated sub-divisional hospitals which also act as Designated STI/RTI Centre **(DSRC).** This services are also being conducted in private run clinics and NGOs enlisted by state AIDS prevention and control society **(SAPCS).**

Apart from this above said activities the center also provides counseling on Prevention of Parent-to-Child Transmission (PPTCT) of HIV/AIDS and also counseled TB patient on HIV/AIDS. Presently VCT centers are remodeled as a hub to deliver integrated services to all clients under one umbrella and renamed as **"integrated counseling and testing centres (ICTC)".**

Q5a. HIV sentinel surveillance. *(SMU, 2014; BUMP, 2013; SSUHSA, 2018, 2023; RGUHS, 2008, 2011; TDMGRMU, 2011; TRIU, 2024)*

Ans: Sero-surveillance evolved into the HIV sentinel surveillance **(HSS),** which was first piloted in 1994 at 52 sites and then formalized into the annual surveillance system in 1998 under the National AIDS Control Programme (NACP) at 176 sentinel sites. HSS was done annually till 2008 and since then it is being carried out every 2 years.

The **15th round** of HIV Sentinel Surveillance (HSS) was implemented at 1323 sites among Antenatal Clinic (ANC) attendees, high-risk groups (HRGs) and bridge populations. These surveillance sites were spread over 651 districts across all States and Union Territories (UTs). Sample collection for HSS 2017 was done during **February–June 2017 at ANC** sites while for the HRG and bridge population sites, samples were collected during **April–August 2017.**

The yearly HIV surveillance system under NACP gradually evolved into biennial (once in every 2 years) HIV sentinel surveillance (HSS). The **17th round**, scheduled to be implemented in 2021, will be implemented among eight population groups [pregnant women, single male migrants (SMM), long-distance truckers (LDT), inmates at central prison sites, female sex workers (FSW), men who have sex with men (MSM), hijra/transgender (H/TG) people and injecting drug users (IDU)] targeting bio-behavioral data collection from almost 5.06 lakh samples. The blood specimen will be tested for four biomarkers, i.e., HIV, Syphilis, HBV, and HCV. **This round will also collect relevant data on the background characteristics, related knowledge, services uptake, and risk behaviors through a focused tool.**

18th Round of HIV Sentinel Surveillance (HSS) 2022–23 shall be carried out in Andaman and Nicobar Islands from 1st January, 2023 to 31st March, 2023 with the rest of the countries. Surveillance is an ongoing, systematic collection, analysis, interpretation and dissemination of data regarding a health related event for the use in public health action to reduce morbidity and mortality and to improve health. The ANC sites are as follows:

- Antenatal clinic, G.B. Pant Hospital, Port Blair
- Antenatal clinic, CHC Rangat (composite site)
- Antenatal clinic, BJR Hospital, Car Nicobar (composite site)
- Antenatal clinic, PHC Garacharma, Port Blair (composite site)

The **18th Round** of HIV sentinel surveillance shall be conducted throughout the A and N Islands under the supervision of three teams, i.e., Central, regional and state level which comprises expertise from WHO, UNAIDS and other national and international agencies who will provide continuous support and guidance.

For successful implementation of surveillance system, capacity building of facility level staff was conducted the 2 days state level training for HSS Site Personnel's of ICTC medical officer in charge, counselors, laboratory technicians and other facility staff at conference hall, Directorate of Industries, Middle Point, Port Blair on 27th–28th December, 2022.

Objectives:

- To determine the level of HIV infection among general population as well as high-risk groups in different states.
- To understand the trends of HIV epidemic among general population as well as high-risk groups in different states.
- To understand the geographical spread of HIV infection and to identify emerging pockets.
- To provide information for prioritizing of program resources and evaluation of program impact.
- To estimate HIV prevalence and HIV burden in the country.

SHORT NOTES AND RELEVANT QUESTIONS ON STI/HIV/AIDS

Q6a. Suraksha clinic. *(NU, 2013)*

Ans: **1253** designated STI/RTI clinics situated at government healthcare facilities **at district and few sub-divisional level hospitals and medical colleges** are providing free standardized STI/RTI services under NACO through

its network. These clinics have been branded as **"Suraksha Clinics"** and provide sexual and reproductive health services. Standardized training to the medical and paramedical personnel based on syndromic case management approach is being provided and counseling services from trained counselors are made available at these clinics. 07 (Seven)

Color coded syndromic drug kits and RPR test kits are being centrally procured and supplied to these clinics. **The signage is provided in the hospitals/clinics for easy identification of the beneficiaries.**

Laboratory support for STI/RTI has been strengthened through a network of 10 regional STI laboratories and 45 state reference centers. The function of these centers are to provide validation of syndromic case management by doing etiologic testing, antibiotic susceptibility testing for Gonococci, external quality assurance services **(EQAS)** for 12 monthly serological tests for syphilis and conduct operations research providing evidence to the program.

Q6b. What do you mean by HIV/AIDS? *(SAMU, 2011; SSUHSA, 2017; SMU 2012)*

Ans: HIV:

- **Human:** Because this disease agent is found only in human and can live only in human beings or human cells.
- **Immunodeficiency:** Because HIV destroys the immune or defense system of the body.
- **Virus:** Because it is a virus, a retro virus. That means it is able to convert RNA into DNA.

AIDS:

- **Acquired:** This means that disease is got but not caught. HIV cannot be caught from air like common cold or caught. It spreads only by few specific routes.
- **Immunodeficiency:** This means that the capacity of the immune system to respond and fight against infections is lost. HIV slowly destroys the body's defense.
- **Syndrome:** This means a collection of signs and symptoms. AIDS is the last stage of HIV infections. AIDS is a disease that presents with different kinds of signs and symptoms. Due to immunodeficiency, an opportunity obtained for many pathogens to infect that person are referred to as "Opportunistic infections (OIs)."

Q6c. Write briefly the clinical manifestations *(SAMU, 2011)*/**WHO criteria for diagnosis of AIDS.**

(BUMP, 2008, 2018)

Ans: WHO case definition: For the purpose of AIDS surveillance an adult or adolescent (>12 years) is considered to have AIDS if at least two of the major signs are present in combination with at least one of the minor signs.

Major signs:

- Weight loss ≥10% of body weight
- Chronic diarrhea for more than 1 month
- Prolonged fever for more than 1 month (intermittent and constant)

Minor signs:

- Persistent cough for more than 1 month
- Generalized pruritic dermatitis
- History of herpes zoster
- Oropharyngeal candidiasis
- Chronic progressive or disseminated herpes simplex infection
- Generalized lymphadenopathy

Q6d. What is ARC (AIDS related complex)? *(SMU 2011)*

Ans: A person with ARC has illness caused by damage to the immune system but without the opportunistic infections and cancers associated with AIDS, they may exhibit one or more of the following clinical signs: unexplained diarrhea lasting for more than 1 month, fatigue, malaise, loss of weight more than 10% of body weight, fever, night sweats or other milder opportunistic infections such as oral thrush, generalized

lymphadenopathy or enlarged spleen. Patients from high-risk groups who have two or more of these manifestations (typically including generalized lymphadenopathy), and who have a decreased number of T-helper lymphocytes are considered to have AIDS related complex. Some patients with AIDS related complex, subsequently developed AIDS.

Q6e. Mention modes of transmission of HIV/AIDS/STIs. *(WBUHS, 2016, 2019; SSUHSA, 2017; SMU, 2012; SAMU, 2011)*

Ans: Mode of transmission of HIV/AIDS:

A. **Sexual transmission:** It is one of the most common modes of transmission.
- Any form of sex, i.e., vaginal, anal or oral sex can spread HIV/STIs followed by AIDS.
- Every single act of unprotected sex with HIV infected person may spread infection to uninfected partners.
- The most commonest mode of transmission is vaginal intercourse.
- Anal intercourse caries higher risk of transmission as it is more likely to injures tissues of uninfected (recipient) partners.
- Oral sex is a mode of transmission but less efficient.

B. **Maternal fetal (vertical) transmission:**
- An infected mother may pass the virus to her child through placenta or during delivery or by breastfeeding.
- About one-third of children of HIV positive mothers get infected through this route.
- Risk of transmission is higher if the mother is newly infected or has already developed AIDS.

C. **Use of infected blood and blood products:**
- HIV is contaminated by blood and blood products like whole blood cells and platelet.
- Contaminated blood is highly infectious by introducing large quantities into the circulation directly.
- Risk of contracting HIV is over 95% from transmission of one unit of blood.

D. **Injectable drug users (IDUs):**
- Contaminated needle, syringes and its containers are risk of HIV transmission.
- Repeated exposure of intravenous/injectable drugs are carrying more risk of transmission.

Q6f. List vertically transmitted diseases. *(ABKUB, 2008)*

Describe prevention of parent to child transmission of HIV *(ABKUB 2008, 2024)*/**mother to child transmission of HIV.** *(RGUHS 2004, DU 2014)*

Ans: List of vertically **(transplacental)** transmitted diseases are enumerated below:

Diseases caused by TORCH agents:

TORCH agents	*Others diseases*	*Nonliving agents*
• T- *Toxoplasma gondi* • R- Rubella virus • C- Cytomegalovirus • H- Herpes simplex	• Varicella virus • Syphilis • Hepatitis B • Coxsackie B • AIDS • Malaria	Thalidomide Diethylstilbestrol (May cause malformations of embryo)

Mother with HIV can transmit HIV to their infants during pregnancy and child birth (30–35% risk) or breast feeding (10–15% risk).

Risk factors:
- Maternal factors
  - Stage of maternal HIV disease
  - Maternal nutritional status
  - Disruption of placental barrier integrity
  - STDs during pregnancy

- Obstetrical factor
  - Vaginal delivery has more risk than cesarean section
  - Preterm delivery
  - Breast feeding
  - Early rupture of membrane
- Child factors
  - Genetic factors of fetus increase the risks
- Viral factors
  - HIV-1 has more transmission rate.

Primary prevention strategies:

Preventing vertically transmitted diseases among reproductive age groups are as follows before they become pregnant.

- Intensive health education to mothers about
  - Preventive measures for STDs
  - Information about risk behavior
  - Education to protect themselves from rape of sexual harassment
  - Education about reproductive health, safe sex consequence of sexual behavior.
  - Sex education at school through trained teachers
- Increasing access to family planning methods to avoid unwanted pregnancy
  - Extensive delivery of family planning services
  - Promotion of double contraceptive methods to prevent risk of pregnancy and protect from STDs
- Expanding access to HIV counseling and testing
  - By identifying HIV infected mother in antenatal period
  - By referring them to ICTC
  - By motivating seronegative mothers to modify their behavior.

Secondary Prevention strategies:

To reduce or prevent risk of vertically transmitted diseases (more commonly HIV) from mother to child

- During pregnancy:
  - Administration of multivitamin supplementation to reduce risk of low birth weight.
  - Avoiding invasive procedures on uterus
  - Antiretroviral therapy (avoid during 1st trimester for fear of teratogenic effect)
  - Zidovudine 300 mg BD from 2nd trimester or 34th week till delivery.
- During childbirth:
  - Antiretroviral therapy (reduces risk of infection from 35 to12%)
  - Zidovudine 300 mg every three hours during delivery
  - Nevirapine 200 mg single dose if mother brought during labor with no history of ART during pregnancy
  - Prevention of premature rupture of membranes

Mode of delivery

- Cesarean delivery
- Method of choice
- Elective cesarean delivery in 36–38th week (reduces risk by 2%)

Vaginal delivery:

- Only if cesarean section is not possible, delivery is done only by health professional preferably by avoiding episiotomy.
- If episiotomy is given, it needs to be sutured as early as possible.
- Vaginal disinfection with 0.25% chlorhexidine
- Do not milk umbilical cord.

Care of newborn:

- Suction from throat first, followed by from nose to prevent swallowing of secretions.
- Wipe baby's body thoroughly with warm, clean towel to remove any blood stained secretions.

- Administer single dose of Nevirapine 2 mg/kg syrup orally to child within 72 hours after birth or Zidovudine 4 mg/kg for 6 weeks.
- Follow-up baby to check HIV infection after 18 months of age
- During breast feeding:
  - Ensure adequate nutrition to mother during postnatal period
  - Advise mother to correct position and attachment to prevent sore nipple
  - Provide breast milk from uninfected lactating mother if possible
  - Practice EBM only up to 3 months followed by animal milk or commercial infant formula (dual feeding not recommended)
  - Inform mother to avoid breastfeeding if she has cracked nipples, mastitis or breast abscess.

Q96. Explain role of high-risk group and bridge population in HIV transmission. *(WBUHS, 2016, 2019; SSUHSA, 2017; SMU, 2012; SAMU, 2011)*/**AIDS is no longer limited to high-risk population.** *(BNMUB, 2006; TRHU, 2024)*

Ans: In India, female sex workers (FSWs), men who have sex with men (MSM), transgender/hijras and injectable drug users (IDUs) have been designated as core high-risk group (HRGs) of population who spread STIs along HIV to the general population. Condom uses vary/less in case of FSWs with their regular partners (Babu). So, chance of STIs and HIV infection for both the partners are high.

Other groups of population play a key role for transmission of infections. They are long distance truck drivers and their helpers and migrant population and they constitute **Bridge Population**. In case of truck driver, they do sex mostly with floating/fly sex workers within the trucks use of condom is less and another factors which help in transmission is use of alcohol and drugs. HIV status of truckers and migrant labors are not known. So, chance of infection with HIV/STIs to general population through bridge population.

Hence, these group of population need to be protected for prevention and control of HIV/STIs.

Q97. HIV is behavioral disease – Explain. *(WBUHS, 2011, 2019; SAMU, 2022)*

Ans: HIV is now becoming a public health problem in India. Various types of behavior are responsible for transmission of HIV.

Unprotected sexual intercourse: It is first and foremost a sexually transmitted disease. Any vaginal, anal or oral sex can spread AIDS. Every single act of unprotected intercourse with an HIV infected person exposes the uninfected partner. Anal intercourse carries a higher risk than vaginal intercourse because it is more likely to injure receptive partners. Unprotected intercourse of adolescent girl is more prone to HIV, because cervix is thought to be less efficient barrier to HIV than in mature genital tract of adults. Behavior of trucker, migrant laborers and tourists (bridge population) can transmit HIV infection from infected population to low risk population.

Needle sharing by injectable drug users is a major cause of AIDS in many countries. Among drug users, who inject heroin, cocaine and other drugs, this route of transmission is significant because exposure is repeated and very often.

Behavior of healthcare providers: If they are not adopting standard precaution measures (not using gloves, masks, aprons, etc.), increases the chance of transmission of HIV.

Behavior of HIV infected blood donor: Some HIV infected persons, who voluntarily donate blood with the objective of transmission of HIV in the community, it carries a very high-risk of transmission.

Q98. Enumerate the various RTI/STI syndromes. *(DU, 2015)*

Ans: **Common symptoms of RTI/STI in men**

- Discharge from private parts/burning or pain during urination/frequent urination
- Genital itching and/or tingling
- Swelling in groin

- Swelling of scrotum
- Blisters or sores on the genitals, anus, mouth, lips
- Discharge from anus
- Growths on genitals, anus or surrounding area (genital warts)

Q6j. Common symptoms of RTI/STI in women.

Ans: Unusual vaginal discharge in quantity, color and smell
- Genital itching
- Abnormal and/or heavy vaginal bleeding
- Pain during sexual intercourse
- Lower abdominal pain (pain below the belly button, pelvic pain)
- Blisters/sores on the genitals, anus or surrounding area, mouth, lips
- Growths on genitals, anus or surrounding area (genital warts)

Q6k. Common complication of STDs. *(BNMUB, 2017)*

Ans: Common complications of untreated STDs are:

Complications both in men and women:
- Increased risk of HIV transmission
- Sterility

Complications in women:
- Pelvic inflammatory disease (PID)
- Ectopic pregnancy
- Cancer cervix
- Reproductive loss-still births/abortions

Q6l. Describe risk factors of HIV/AIDS. *(BUMP, 2008, 2009; RUJH, 2024)*

Ans: Risk factors of HIV/AIDs:
- **Multiple sexual partners:** Chance of infection will increase.
- **Male homosexuals:** Chance of infection will increase. Injury is more such cases.
- **Unprotected haterosexuals:** Sero-different couples may be affected by unprotected intercourse.
- **Anal intercourse:** Chance of infection will increase. Injury is more such cases.
- **Injectable drug users:** Single injectable drug syringe users share the viruses among users.
- **Recipients of blood and blood products:** Blood is capable of infecting the recipients.
- **Presence of ulcer and discharge:** HIV gets entry easily through ulcers.
- **Presence of genital warts:** HIV gets entry easily through warts ulcers.
- **Human papilloma virus:** Patients with human papilloma virus.
- **Hemophiliacs:** As repeated blood is introduced, chance of HIV infection increases.
- **Positive cases of HIV:** He/she may develop AIDS without treatment within a short period of time.

Q6m. ICTC should be supported by ART/Link ART center – Explain. *(WBUHS, 2014)*

Ans: Link ART Centers (LACs) were originally planned under NACP III. In order to facilitate the delivery of ART services nearer to the beneficiaries, it was decided to set up link ART centers located mainly at ICTC in the district/sub-district level hospitals nearer to the patient's residence and link to a nodal ART center within accessible distance.

Through efficient planning and rapid scale up as of 2015, total 512 ART centers and 1080 Link ART centres are functioning in India.

ICTC deals with suspect case of HIV/AIDS. If a patient is diagnosed as a case of HIV/AIDS with the basic diagnostic test done at ICTC, Antiretroviral therapy (ART) can be provided from the nearest centers/ICTC. The patient should not be harassed to get it from a place far from his/her residence. An ART center diagnoses

case and provides treatment and guides the patient to get the drugs from nearby center which is called link ART center.

So, **ICTC acts as ART/Link ART center for the benefit of the beneficiaries.**

Q. Opportunistic infections in AIDS. *(TDMGRMU, 2015; NU, 2013; ABKUB, 2019)*

Ans: Opportunistic infections are highly prevalent among AIDS patients. Organisms of low or nil pathogenicity may cause infections or disease in these patients.

The main aim of existing therapies of HIV infection is to treat or prevent secondary opportunistic infections which are observed in such patients. The following are the opportunistic infections with suggestion of management:

- ***P. carinii* pneumonia:**
  - Indicated in patients with CD4 count below 200 cell/mL
  - Trimethoprim-sulfamethoxazole/aerosolized pentamidine/dapsone
- ***M avium* complex:** 1/3 of cases of AIDS are seen with this organism.
  - Indicated in patients with CD4 count <200 cell/mL
  - Rifabutin decreases the incidence
- ***M. tuberculosis:*** Most common opportunistic infection in India is tuberculosis.
  - It requires treatment
  - 300 mg Isoniazid daily for 9 months to 1 year
  - Given to all HIV infected patients with positive Mantoux test
- **Kaposi's sarcoma:** Interferon, chemotherapy or radiation
- **Cytomegalovirus retinitis:** Ganciclovir
- **Cryptococcal meningitis:** Fluconazole
- **Esophageal candidiasis or recurrent regional candidiasis:** Fluconazole or ketoconazole
- **Herpes simplex and herpes zoster:** Acyclovir

Q. What is window period? *(RGUHS, 2010; TRIU, 2016; TDMGRMU, 2008; BUMP, 2012, 2016; KIMS, 2015; NU, 2010; SMU, 2009)*

Ans: Window period is the interval period between infection with HIV virus and appearance of antibodies in the serum. This is the period where virus remains latent in the host cell for a short period of time during when no antibody can be detected in the blood.

- **Duration:** Usually 12 weeks
- **Significance:** The HIV infected person is most infectious in the window period when the diagnosis of HIV is not possible with standard antibody test thus the person remain potential source of infection to others and transmission of infection cannot be controlled. Though no antibodies can be detected in the blood, diagnosis of HIV infection in the window period can be done by **RT PCR** test though it is very costly usually not a routine procedure.

If the person is highly suspected to have HIV negative after investigation, the test should be repeated after 3 months.

Q. Contact tracing in STIs. *(RGUHS, 2010; TDMGRMU, 2010, 2012; NU, 2014)*

Ans: Contact tracing is an intervention strategy adopted for control of STI/STDs.

- **Principle:** It is the method of case detection wherein sexual partners of diagnosed patients are identified, located, investigated and treated.
- **Procedure:** The diagnosed patients are interviewed for their sexual contacts by specially trained staff. Then the contacts are traced and contracted via telephone, mobile, etc., and then persuaded to attend the STD clinic for examination and treatment, preferably before completion of incubation period.
- **Limitation:** Success of contract tracing entirely depends upon willingness of patients to disclose their all sex contacts voluntarily.
- **Significance:** It is one of the best possible methods of controlling spread of STD/STIs.

Q6q. Screening for diseases in blood bank. *(RGUHS, 2008)*

Ans: This is related to WHO guideline for regulating blood bank. Any donor blood should be screened for following diseases to prevent their transmission to the patient:

- ELISA test for HIV type 1 and type 2 viruses
- ELISA for hepatitis B and hepatitis C virus
- VDRL test for syphilis
- Rapid diagnostic test for confirmation of malaria
- Test for Chagas disease and brucellosis in selected regions

Q6r. Describe in brief the guidelines for PEP in HIV/AIDS (postexposure prophylaxis) in healthcare settings. *(ABKUB, 2019; TRIU, 2014, 2016, 2021; SSUHSA, 2011, 2018; MGUB, 2023; AFUH, 2023)*

Ans: Postexposure prophylaxis of HIV is a series of procedures including taking anti-HIV drugs by persons exposed to a risk as early as possible.

- **Objectives:** To prevent HIV infections to the cell.
- **Indications:**
  - Needle prick injury.
  - Exposure to large amount of infected blood.
  - Infected blood coming in contact with open wounds or cut of the body.
  - Exposed to other body fluids of the infected person.

When to start prophylactic measures after exposure?
It should be started as early as possible preferably within 2 hours/after 72 hours it is useless.

Duration of therapy: Four weeks (it is a medical emergency and should be started immediately)

Procedure:

- Wash the needle prick and cut area with soap and use running tap water.
- Irrigate the eyes with clean water or normal saline. Avoid reflex sucking of pricked finger, instead squeeze it to encourage bleeding and then apply antiseptic like sprit.
- **Treatment regime: Basic regime:** AZT (Zidovudine) 600 mg daily in divided doses + 3 TC (Lamivudine) 150 mg twice daily for 4 weeks.
- **Expanded (when source is known case of HIV) regime:** AZT 600 mg daily in divided doses + 3 TC (Lamivudine) 150 mg twice daily + Indinavir 800 mg trice daily or Nelfinavir 750 mg trice daily for 4 weeks.

Q6s. One pregnant women whose husband was found to be HIV positive, came to OPD on 2nd semester. How do you manage the case and what advice you give to the couple? *(RUJH, 2011)*

Ans: Pregnant mother should be screened whether she is HIV negative or HIV positive. There is possibility of positivity in the pregnant woman. And she may be found negative for HIV in case of to low viral load in the husband.

Many sero-different couples (where one is HIV positive and the other is not), have had and continue to have healthy HIV negative babies. It is possible wife is HIV negative whilst husband tests HIV positive. The risk of HIV infection relates to many things, including partner's viral load (i.e., how infections he is). Not every exposure results in HIV infection and the lady may also have just been lucky so far. It doesn't mean that she is protected as she could still be at risk of getting HIV later on. When the positive partner is taking ARVs with low viral load, hence risk of transmission is low.

Considering this discussion, the advice may be as follows:

- HIV status testing of mothers.
- If the test result be positive, she will start medication for HIV infection to reduce the viral load.
- If the test result be negative, then it becomes easier to protect herself and the baby. After 3 months, the test may be repeated, if positive, then treatment should be started.

- Protected sex or no sexual intercourse should be followed till the baby is born.
- ARVs of husband should be continued as it is a chronic controllable disease.

Q64. Universal precaution. *(BNMUB, 2016; SSUHSA, 2022, 2023; RGUHS, 2024; KIMS, 2023)*

Ans: These are the set of precautions designed to prevent transmission of blood borne and other infections. These are called **universal precaution** because these should be employed for every patient, considering as he/she is HIV positive or positive for other infectious disease.

These are as follows:

- Hand washing after any direct contact with patients.
- Safe collection and disposal of needles (hypodermic and suture) and sharps (scalpel and blades, lancets, razors, scissors) with required puncture proof safety boxes in each patient care area using a safe hospital waste management and disposal system.
- Wearing gloves for contact with body fluids in nonintact skin and mucous membranes.
- Wearing a mask, eye protection and a gown (plastic apron) as blood or other body fluids might splash. Covering all cuts and abrasions with water proof dressing, properly and carefully cleaning up spills of blood and other body fluids.
- Separator resuscitator bags should be used preferably over mouth-to-mouth breathing.
- Do not use mouth pipette; always use pipette with rubber bulb.
- Process all laboratory specimens properly as potentially infectious.

Q65. HIV-TB collaboration activities are extremely important for control of HIV and TB in India – Explain. *(WBUHS, 2019; AKUB, 2022; GNSUB, 2023)*

Ans: Joint HIV-TB collaboration activities was developed in 2007 with latest revision in 2013. The salient features of the frameworks are:

- Emphasis on integrated TB and HIV services
- HIV testing and counseling among presumptive TB cases
- Intensified TB case finding in HIV positive cases
- Air borne infection control in HIV/TB care settings
- Focus on early detection of TB cases as well as drug resistant TB cases
- Strengthen HIV/TB activities among children and pregnant women
- Participation of private and NGO facilities

In June 2012, the intensified TB/HIV package was rolled out across the whole country. In 2014, more than 10 lakh TB patients tested positive for HIV and about 44,000 (4% of those tested) tested positive for HIV. They were offered access to HIV care with 94% patients put on cotrimoxazole prophylactic therapy (CPT) and 91% on antiretroviral therapy (ART).

RABIES RELATED QUESTIONS AND ANSWERS

Q66. Discuss the problem, epidemiological factors and prevention of rabies. *(BNMUB, 2018, 2019; ABKUB, 2021; RGUHS, 2024)*

Ans: An estimated 59,000 people die of rabies every year, primarily in poor rural communities in **Africa and Asia**. Almost all of them contracted rabies from an infected dog with the rabies virus. Rabies has the highest fatality rate of any disease and around 40% of those are children who die from rabies' agonizing symptoms. Reporting of these deaths is extremely poor. Though the disease is entirely preventable, we have safe and effective vaccines to protect people, animals and their livestock from rabies infection.

India reported about 18,000–20,000 cases of rabies a year and about 36% of the world's deaths from the disease. Reported incidence is probably an underestimation because in India rabies is still not a notifiable disease. In India, rabies affects mainly people of lower socioeconomic status and children between the ages

of 5 and 15 years. Indian children often play near stray dogs, which are many and roam freely, and are used to sharing their food with them, which results in frequent bites.

It is crucial to administer antirabies immunoglobulin immediately after a bite categorized as severe (grade III), but erroneous wound categorization by healthcare providers, especially in cases presenting late for treatment, greatly increases the chances that rabies will develop. WHO recommended intradermal vaccination in low-resource settings with the emphasis on completion of full course.

Epidemiology: It is generally accepted that bats are the true primary reservoir hosts of almost all lyssaviruses like rabies viruses (RABVs). From the primary reservoir hosts, the virus is sporadically transmitted to domestic animals and to humans. Of all carnivore host reservoirs, the domestic dog is responsible for more than 90% of all human rabies fatalities worldwide. Typical carnivore host reservoirs for RABV in **Middle East and Asia** are domestic dog (*Canis lupus familiaris*).

Prevention: Rabies is a serious disease, but individuals and governments can do and take action to control and prevent, and, in some cases, wipe it out completely. **Strategies includes:**

- Regular antirabies vaccinations for all pets and domestic animals
- Bans or restrictions on the import of animals from some countries
- Widespread vaccinations of humans in some areas
- Educational information and awareness

Individual precautions: Individuals should follow **some safety rules to reduce the chance of contracting rabies.**

- **Vaccinate pets:** Cat, dog, ferret, and other domestic or farm animals should be vaccinated.
- **Protect small pets:** They should be kept in a cage or inside the house should be vaccinated.
- **Reporting to the local authorities:** Contact local animal control officials or police departments if you see animals roaming.
- **Do not approach wild animals:** Animals with rabies are likely to be less cautious than usual, and they may be more likely to approach people.
- **Keep bats out of the home:** Seal your home to prevent bats from nesting. Call an expert to remove any bats that are already present. In 2015, a woman died from rabies after being bitten by a bat during the night. She did not realize she had been bitten.
- Availability of vaccines and antirabies immunoglobulin in all hospitals and primary healthcare.
- Medical colleges need to train interns on exposure to animal bite management.
- The primary school curriculum should include developing rabies awareness among students. All dogs should be given the oral vaccine against rabies through baits (i.e., dog foods laced with oral rabies vaccine) and stray animals should be **sterilized** to reduce the vector population.
- Rabies should be declared a notifiable disease.

Q8a. **A 10-year-old child reported with dog bite on calf muscle in casualty OPD within 2 hours of bite. As the CMO, suggest measures to prevent rabies in this child.** *(WBUHS, 2010; NU, 2016, 2017)*

Q8b. **WHO categories of exposure in rabies.** *(ABKUB, 2007)*

Q8c. **A 15-year-boy is bitten by a street dog. How will you manage the case?** *(SSUHSA, 2013; TRIU, 2013; NU, 2016)*

Q8d. **Describe in brief management of a lacerated bite by a stay dog of a 2 years child in a remote village of Patna district.** *(ABKUB, 2007, 2018)*

Q8e. **A child bitten by a street dog on hands and fingers was brought to casualty ward of medical college within an hour of bite. As MO I/C what measures will you suggest to prevent rabies in this case?** *(WBUHS, 2008)*

Q8f. Raju, 12-year-old boy, bitten by a stray dog, was brought to you. On examination, there were two lacerated wounds on right leg. Dog was killed. How will you categorize the exposure? Write down the management of the case. *(WBUHS, 2016, 2017, 2019; KIMS, 2019; RUJH, 2011)*

Q8g. A 30-year-old male attended OPD with scratch and without oozing of blood on his left leg inflicted by pet dog of his neighbor last night. The dog is not vaccinated. How would you manage the case? *(WBUHS, 2019)*

Q8h. A man comes to your health center with lacerated injury of both legs caused by the bite of a dog about an hour ago. Discuss steps of management. *(WBUHS, 2012; SSUHSA, 2018; KIMS, 2024)*

Q8i. Describe postexposure prophylaxis [PEP] of rabies. *(WBUHS, 2021; BNMUB, 2014, 2021; ABKUB, 2022, 2023; TDMGRMU, 2011; BUMP, 2008, 2013; SSUHSA, 2006, 2012; RUJH, 2013; AFUH, 2023)*

Q8j. A person was bitten by a dog in the street. The bite was single and in face. What is the category of bite? Outline the management of this case. *(WBUHS, 2014; SAMU, 2022; TRIU, 2021; MGUB, 2024)*

Ans: At first comprehensive history taking and clinical examination should be done and categorization of dog bite is done using following classification.

Type of contact, exposure and recommended prophylaxis

Category	*Types of contact*	*Type of exposure*	*Recommended postexposure prophylaxis*
I	• Touching or feeding of animals • Licks on intact skin • Contact of intact skin with secretions/excretions of rabid animal/human case	None	• None if reliable case history is available • Wash exposed area with water and soap and apply antiseptic
II	• Nibbing of uncovered skin • Minor scratches or abrasions without bleeding	Minor	• Wound management • Rabies vaccine
III	• Single or multiple transdermal bites or scratches (wounds that bleed) • Licks on broken skin • Contamination of mucus membrane with saliva, i.e., licks	Severe	• Wound management • Rabies immunoglobulin • Rabies vaccine

PEP is a three-pronged approach. All three approaches carry equal importance and should be done simultaneously as per the category of exposure.

A. Management of animal bite wounds
B. Passive immunization with rabies immunoglobulin (RIG)
C. Active immunization with antirabies vaccines (ARV)

Management of animal bite wounds:

Local treatment of the wound:

Purpose of local wound wash is to remove as much as virus as possible from the site of inoculation before it can be absorbed on nerve endings. It is of maximal value when applied immediately after exposure.

Different aspects of local treatment are as follows:

- **Cleansing:** Immediate flushing and washing of the wounds, scratches and adjoining areas with plenty of soap and water, preferably under a running tap for at least 15 minutes. It minimizes the risk of contracting rabies.
- **Chemical treatment:** Whatever residual virus remains in the wound, after cleansing, these should be inactivated by irrigation of povidone iodine, chlorhexidine, cetrimide solution.
- **Suturing**: Usually not recommended, but if necessary, severe bite wounds at any site should be treated with daily dressing followed by secondary suturing.

- **Local infiltration of RIGs:** In category III bites, RIGs should be infiltrated in the depth and around the wound to inactivate the locally present virus.
- **Antibiotics:** It is given to prevent sepsis in the wound.
- **Tetanus toxoid:** It is given for unimmunized individuals.

Passive immunization with rabies immunoglobulins:

Types of rabies immunoglobulin (RIGs): Two types of rabies immunoglobulin are available:

a. **Equine rabies immunoglobulin (ERIGs):** Currently manufactured ERIGs are highly purified, potent and occurrence of adverse events has been significantly reduced. It is given in a dose of 40 IU/kg body weight of patient and given after testing of sensitivity up to a maximum of 3,000 IU. Some manufacturers of ERIGs still recommended performing a sensitivity test. These should be given at a place having facilities to manage anaphylaxis.

b. **Human rabies immunoglobulin (HRIGs):** They are free from side effects and safer to use without sensitivity testing. It is given in a dose of 20 IU/kg body weight of patient up to a maximum of 1,500 IU.

Multiple needle injections into the wound should be avoided. Remaining dose if any, after all wounds have been infiltrated, should be administered by deep IM injection at a site distant from vaccine injection site. The total recommended dose of immunoglobulin must not be exceeded as it may suppress the antibody production by the vaccine.

Rabies immunoglobulin for passive immunization is administered only once, preferably within 24 hours after the exposure (on day 0 along with the 1st dose of ARV). If the immunoglobulin was not administered when vaccination was begun, it can be administered up to 7th day after the administration of the 1st dose of vaccine.

Active immunization with ARV:

Antirabies vaccine *(SSUHSA, 2010)*

There are two types of vaccines available:

Intradermal regimen (ID) *(WBUHS, 2013; GNSUB, 2022; RGUHS, 2005, 2014; SMU 2014; MGUB, 2023)*

Four doses are given on days 0, 3, 7, 28 days (day 0 indicates date of 1st injection). Dose 0.1 mL given on both deltoid area, intradermal route. It is a freeze-dried vaccine, which is reconstituted with diluents supplied by manufacturer and the vaccine is stored in a refrigerator at 2–8°C.

Vaccine approved for ID route in India includes:

- Purified vero cell vaccines, namely Verorab, Abhayrab and Indirab.
- Purified chick embryo cell vaccine, namely Rabipur and Vaxirab N.

Intramuscular regimen [IM]:

Essen schedule: Five doses are given on 0, 3, 7, 14, 28 days, each dose 0.5 mL intramuscular in deltoid area. Sixth dose (day 90) is optional and should be given only in extremes of age, those who are immunologically deficient, or under steroid therapy.

SHORT NOTES AND RELEVANT QUESTIONS ON RABIES

Q9a. Prevention of human rabies. *(BNMUB, 2012)*

Ans: After the bite of different animals, if proper precautions are taken for prevention of human rabies, the deadly disease can be prevented. History and clinical examination should be done for classification. Comprehensive history taking and clinical examination should be done and categorization of dog bite is done using above said classification discussed in the previous question.

Category I/II/III, local treatment of the wound and remaining answer from Q8j.

Q9b. What is pre-exposure prophylaxis? *(WBUHS, 2014; SAMU, 2022; ABKUB, 2023)*

Ans: **Pre-exposure prophylaxis (PrEP)** is recommended for anyone who is at continual, frequent or increased risk of exposure to rabies virus. The high-risk groups are laboratory workers handling virus and infected materials, veterinarians, animal handlers and catchers, wildlife wardens, clinicians and paramedics attending human rabies cases, quarantine officers and travelers from rabies free area to rabies endemic areas.

Pre-exposure vaccination is administered 0.5 mL intramuscular (IM) or 0.1 mL intradermal (ID) on days 0, 7 and either day 21 or 28. Person having continuous high-risk of exposure should have checked neutralizing antibody titers every 6 months during the initial 2 years period after the primary vaccination. The professionals who are not in continuous risk of exposure through their activities such as certain categories of veterinarians and animal health officers should have serological monitoring every 2 years. A booster dose is required only when neutralizing antibody titer falls to <0.5 IU/mL.

Q9c. Measures for minimizing human rabies in the area *(WBUHS, 2012; SSUHSA, 2018)*/**Explain the strategies of prevention of rabies in India.** *(WBUHS, 2016, 2017; RUJH, 2011)*

Ans: Since dog is the major source of infection, the most logical and cost-effective approach is the elimination of stray and ownerless dogs combined with a program of swift mass immunization in the shortest possible time of at least 80% of entire dog population of the area. All dogs should receive primary immunization at the age of 3-4 months and booster doses should be given at regular intervals, according to the type of vaccine used.

Other methods include:

- Registration and licensing of all domestic dogs.
- Restraint of dogs in public places.
- Quarantine for about 6 months of imported dogs.
- The stray dogs are **sterilized** and released in the same area. But such program needs to be done in a large scale with 6 months period so that next dog reproductive cycle can be covered.
- Health education of the people regarding the care of dogs and prevention of rabies.

Q9d. Fixed virus. *(NU, 2014)*

Ans: The virus is excreted in the saliva of the affected animals. The virus recovered from naturally occurring cases of rabies is called "street virus." It is pathogenic for all mammals and shows a long variable incubation period (20-60 days in dogs). Serial brain to brain passage of the street virus in rabies modifies the virus such that its incubation period is progressively reduced until it becomes constant between 4-6 days. Virus isolated, at this stage, is called a fixed virus. So, fixed virus may be defined as a stain of virus that has a short, fixed and incubation period within 4-6 days and infected into suitable animals. Intracerebrally which does not produce Negri bodies. It is no longer multiplies in extra-neural tissues. The fixed virus is used for the preparation of antirabies vaccine.

Q9e. Essen regimen and rabies immunoglobulin for passive immunization in postexposure period of animal bite. *(SAMU, 2016)*

Ans: **Essen regime or schedule** is intramuscular injection of antirabies vaccine among the persons who were bitten by virus carrying capable animals. It may be scratch instead of bite. **In 1984, the regime was advocated by World Health Organization at "Essen" of Germany.**

Construct the answer regarding passive immunization with rabies immunoglobulins from Q8j.

PLAGUE RELATED QUESTIONS AND ANSWERS

Q10. How do you confirm the diagnosis of plague? Discuss the plague control measures. *(BNMUB, 2002)*

Ans: Plague is primarily and basically a zoonoses caused by ***Yersinia pestis*** involving rodents (***Tatera indica***) and rat flea (***Xenopsylla cheopis***). **Quarantine was first applied for plague on 1918.**

Diagnosis of plague: The absolute **confirmation of plague infection** in human beings, rodents and fleas require the isolation and identification of plague bacillus. The important laboratory methods of diagnosis are as follows:

a. **Staining:** Smears are prepared from bubo fluid and sputum which should be fixed with alcohol and then stained with Giemsa's or Wayson's stain to demonstrate bipolar bacilli in the specimen.
b. **Culture:** Blood culture should be done for all patients. Appropriate culture media should be inoculated on the spot with blood, bubo fluid or sputum to ensure speedy isolation of the plague bacilli. Otherwise the specimen transported to laboratory in Carry-Blair transport medium.
c. **Serology:** Acute and convalescent specimen of blood sera should be collected for antibody studies.

Plague control measures are discussed below:

A. **Control of cases:**
- *Early diagnosis:* During epidemic situation, diagnosis of plague can be made readily on clinical grounds e.g., acute fever and painful lymph node enlargement developing into bubos in the inguinal and other regions of the body. Dead rats provide a useful warning of a possible outbreak. Plague suspected humans and rodents should be examined bacteriologically to confirm the presence of plague.
- *Notification:* If a human or rodent case is diagnosed, health authorities must be notified promptly.
- *Isolation:* All cases of bubonic plague including suspected cases should be isolated. Although most bubonic plague patients are not infectious, but isolation is required whenever possible.
- *Treatment:* Treatment must be started without the confirmation of diagnosis as mortality rate is 50% and in pneumonic plague it is 100%. The drug of choice is Streptomycin - 30mg/kg body wt intramuscularly in two divided doses for 7-10 days; Tetracycline - orally 30-40 mg/kg body wt in an alternate days.
- *Disinfection:* Sputum, discharges and articles used by patients should be disinfected. Dead bodies should be handled with aseptic precautions.

B. **Control of fleas:** The most effective methods to break the transmission chain (Rodent - flea - man) is destruction of rat fleas by proper application of an effective insecticide. Flea control must precede or coincide antirodent measures. In general DDT and BHC should be used as dust containing 10% and 3% of active ingredient respectively. Before spraying the inhabitants of premises should advised to remove all foodstuffs and eating and cooking vessels from their houses. Spraying is done inside the houses covering the entire floor area, bottom of all walls up to 3 feet above the floor level, back of the doors, roofing of thatched houses, crevices of walls, rat runs, clothing, bedding, cats, dogs and other pets. Rat burrows should be inflated with the insecticidal dust with the help of dust blower. Insecticidal spraying up to a radius of 5 miles around each infected locality. Within 48 hours of application the flea index should drop down to zero.

C. **Control of rodents:**
- Based on improvement of general sanitation, housing and quality of life. The environmental sanitation measure comprises a) Proper storage, collection and disposal of garbage, b) Proper storage of food stuffs, c) Construction of rat proof buildings, godowns and warehouses, and d) Elimination of rat burrows by blocking them with concrete.
- *Trapping:* Trapping causes temporary reduction in number of commensal rodents. The 'wonder trap' developed by the Haffkine Institute, Mumbai is created to trap as many as 25 rats at a time. The traps are usually baited with indigenous foods of the locality. The captured rats must be destroyed which may be done by drawing them in water. Rats by nature are suspicious animals and will soon become "trap-wise" and avoided baited traps.
- *Rodenticides:* Commonly used, barium carbonate. It is white tasteless powder and is very cheap. It mixed with wheat or rice flour in the ratio of 1:4. The mixed materials is moistened with water and made into small round marbles. After eating the pills, rats are killed in 2-24 hours. Another efficient rodenticide are **Zinc phosphide**. It is used in the ratio of 1:10 in wheat or rice flour and mixed with a few drops of edible oil to make it more attractive to rats. Rats are killed by 3 hours.

D. **Vaccination:** In 1897, Haffkine developed a killed vaccine later modified by Sokhey, a formalin killed vaccine. The vaccine is given subcutaneously at an interval of 7-14 days. Immunity starts 5-7 days after inoculation and last for about 6 months. Booster doses are recommended 6 monthly for persons at

continuing risk of infection (geologists, biologists and anthropologists). However, in an emergency situation single injection given but dose should be double the 2nd dose as given below. Doses for adult males: 1.0 mL (1st dose), 1.5 mL (2nd dose) and 1.0 mL booster dose and in case females 0.75 mL (1st dose), 1.0 mL (2nd dose) and 0.75 mL booster.

F. **Surveillance:** The area where natural plague foci exist or history of past infection surveillance is essential. It should cover all aspect of human and rodent plague, e.g., microbiology, serology, entomology, mammalogy, epidemiology and ecology.

F. **Health education:** Emphasis must be given on prompt reporting of dead rats and suspected human cases. Medical practitioners should keep in mind in differential diagnosis of any fever cases with lymphadenopathy or when multiple cases of pneumonia occur.

SHORT NOTES AND RELEVANT QUESTIONS ON PLAGUE

Q11a. Blocked flea. *(RGUHS, 2012, 2024; TDMGRMU, 2010; SSUHSA, 2013; SAMU, 2022; VKSUAB, 2019; YSRUHSAP, 2020; GOAU, 2021)*

Q11b. Partial blocked fleas are more dangerous than the complete blocked fleas – Explain. *(WBUHS, 2016; KIMS, 2023, 2024)*

Ans: Blocked flea is a rat flea with fully blocked proventriculus so that no food can pass through, leaving the stomach empty and leading flea to starvation.

Mechanism:

- A rat flea can ingest up to 5 cu mm of blood ingesting about 5,000 plague bacilli along with it.
- These bacilli multiply enormously in gut of rat flea blocking proventriculus.
- Such flea due to inability to obtain blood meal, faces starvation and eventually death occurs. Thus it makes frantic efforts to bite and suck blood over and over.
- It inoculates plague bacilli into bite wound each time it bites.

Significance: A **blocked flea** is an efficient transmitter of plague and a partially blocked flea is more dangerous than a completely blocked flea as it can live longer period of time but a **Partially blocked fleas** may live up to a year and certain species survive in the burrow in micro-climate for 4 years.

LEPROSY RELATED QUESTIONS AND ANSWERS

Q12. Describe the epidemiology of leprosy. *(TDMGRMU, 2008)*

Ans: **Epidemiology of leprosy:**

A. **Agent factors:**

- *Agent:* Leprosy is caused by *M. leprae.* They are acid fast, occur in clumps or bundle
- *Source of infection:* Active leprosy must be considered infectious. Inapparent infections are also source of infection
- *Portal of exit:* Nose is the major portal of exit
- *Infectivity:* Highly infectious with low pathogenicity.

B. **Host factors:**

- *Age:* Incidence rate is peak between 10–20 years. High prevalence of infection among children means the disease is active and spreading
- *Gender:* Higher in males than females
- *Migration:* Because of the movement from rural to urban areas, it creates problem in urban areas
- *Immunity:* It has been established that only a few person exposed to infection develop the disease. A large proportion of early lesion heals spontaneously. Subclinical infections are common, they also contribute to active immunity.

C. **Environmental factors:**
- Humidity favors the survival of *M leprae*. It can remain viable in dried nasal secretions for at least 9 days and in moist soil in room temperature for 46 days.
- Overcrowding and lack of ventilation favor leprosy.

Q13. Discuss classification, cardinal signs, diagnosis (history, physical examination, investigation), complications of leprosy, treatment (MDT as per WHO) of leprosy. *(WBUHS, 2007, 2011, 2019; SAMU, 2022; SSUHSA, 2011; SMU, 2013; TRIU, 2020; KIMS, 2019)*

Ans: Classification of leprosy: The Indian classification is the official classification of Indian Leprosy Association in 1981.

It is a clinico-bacterial classification. The clinical characteristics of various types are described below:
- **Indeterminant type:** Those are early cases with one or two vague hypopigmented macules and definite sensory impairment. These lesions are bacteriologically negative.
- **Tuberculoid type:** Those cases with one or two well-defined lesions, which may be flat or raised, hypopigmented or erythematous and anesthetic also. These lesions are bacteriologically negative.
- **Borderline type:** Those cases with four or more lesions which may be flat or raised, well or ill-defined, hypopigmented or erythematous and show sensory impairment or loss. Bacteriological positivity of these lesions are variable. If not treated, those lesions may progress to lepromatous type.
- **Lepromatous type:** Those cases with diffuse infiltration or numerous flat or raised, poorly defined, shiny, smooth, symmetrically distributed lesions. These lesions are bacteriologically positive.
- **Pure neurotic type:** Those cases of leprosy with nerve involvement but no lesions are seen in the skin. These lesions are bacteriologically negative.

After the clinical examination, leprosy patients classified on the basis of presence of patch/s.
- **Paucibacillary leprosy:** 1-5 hypopigmented patches and/or only one nerve involvement
- **Multibacillary leprosy:** Six or more hypopigmented patches and/or more than one nerve involvement
- **Diagnosis of leprosy:** It consists of history, physical examination and investigation
- **History:** It should be taken thoroughly. It consists of following components:
  - Collection of bio-data such as name, age, sex, occupation, place of residence, etc.
  - Family history of leprosy, history of contact with leprosy cases, previous history of treatment and present complaints.

Cardinal features of leprosy: *(WBUHS, 2019)*

P	Hypopigmented patch/s
A	Partial or total loss of cutaneous sensation in the affected areas [Testing for: (a) loss of sensation for heat, cold, pain, light touch and (b) paresis or paralysis of the muscles of hands and feet, leading to disability and deformity]
N	Presence of thickened nerves Palpation of commonly involved peripheral and cutaneous nerves for presence of thickening and/or tenderness. The nerves are commonly involved ulnar nerve, great auricular nerve, lateral popliteal nerve and dorsal branch of radial nerve
A	Presence of Acid-fast bacilli

Physical examination: It consists of thorough inspection of body surface to assess any evidence of leprosy.

Investigation: Bacteriological examination: It can be done at subdivision, district hospital or above. The following samples can be taken for bacteriological examination:
- **Skin smear:** Sample is taken from active skin lesion and one ear lobe by slit and scrape method is taken. Two sites are examined.
- **Nasal smears or blows:** It can be best prepared from early morning mucous material. The patient blows his nose into a clean dry sheet of cellophane or plastic.
- **Nasal scrapings:** It is not recommended routinely, because it is painful procedure.

Following indices are used:

Bacterial index: It indicates the density of leprosy bacilli in smears and includes both living and dead bacilli. According to **Ridley's logarithmic scale**, it ranges from 0 to 6+ and is based on the number of bacilli seen in an average microscopic field of the smear using an oil immersion objective.

Grading:

- 0 - No bacilli in any of the 100 oil immersion field.
- 1+ - 10 bacilli on average, in 100 oil immersion fields.
- 2+ - 10 bacilli on average, in 10 oil immersion fields.
- 3+ - 10 bacilli, on average in each oil immersion fields.
- 4+ - 100 bacilli, on average in each oil immersion field.
- 5+ - 100–1,000 bacilli, on average in each oil immersion field.
- 6+ - More than 1,000 bacilli in each oil immersion field.

Morphological index: It is calculated after examining 200 pink stained free staining bacilli. The percentage of solid staining bacilli in a stained smear referred to a morphological index **(MI).**

Other methods of investigation are:

- **Foot pad culture**
- **Histamine test**
- **Complications of leprosy:** Certain types of deformities can occur in leprosy, particularly in multibacillary leprosy like mask face, leonine facies, loss of eyebrows and eyelashes, corneal ulcer, perforated nose, depressed nose, etc. Claw hand, wrist drop, ulcers, absorption of digits, swollen hand and loss of fingers, etc. Planter ulcer, foot drop, inversion of foot, clawing of the toes and loss of toes, etc.

WHO recommended [multidrug therapy (MDT)] treatment of leprosy cases. *(WBUHS, 2012; BNMUB, 2012; ABKUB, 2010, 2015; RGUHS, 2012; TRIU, 2016, 2021; SAMU, 2011; SMU, 2012; SSUHSA, 2010, 2012, 2023; NU, 2016; SMU, 2015; KIMS, 2015; MU, 2019; VBUJH, 2023; GNSUB, 2023)*

Types of leprosy	*Name of drugs*	*Duration of treatment*
Multibacillary cases	**Rifampicin** – 600 mg once monthly supervised	12 months, to be completed within 18 months
	Dapsone - 100 mg once monthly supervised and 100 mg once daily self-administered	
	Clofazimine - 300 mg once monthly supervised and 50 mg once daily self-administered	
Paucibacillary cases	**Rifampicin** – 600 mg once monthly supervised	6 months, to be completed within 9 months
	Dapsone - 100 mg once monthly supervised and 100 mg once daily self-administered	

Note: Regularity of treatment: If a patient has taken **two third of treatment** for any given time period and the interval between doses is not more than 2 months, is considered regular.

The patient is instructed to collect medicine from the center. He is asked to bring the empty blister pack at the time of collection of new pack. The patient if does not turn up to collect monthly blister pack is contacted to ascertain the reason and corrective actions are taken.

Revised classification of leprosy in India: (From 1st April, 2025)

Any one or more of the cardinal sign/s and/or laboratory test result as mentioned below:

Sl no.	*Type*	*Skin lesions*	*Nerve (s) involvement*	*Bacilli in laboratory-based test (slit skin smear)*
1	Paucibacillary (PB)	1–5	No nerve (0)	Absent (negative)
2	Multibacillary (MB)	>5	One or more nerve involved (≥ 1)	Present (positive)

Q13c. Revised treatment regimen of leprosy in India: (From 1st April, 2025)

Sl no.	Type		Duration of treatment	Dapsone	Clofazimine	Rifampicin
1	Paucibacillary (PB)	Adult	6 months	100 mg daily	300 mg once a month and 50 mg daily	600 mg once a month
		Child (9–14 yrs)	6 months	50 mg daily	1,500 mg once a month and 50 mg daily	450 mg once a month
2	Multibacillary (MB)	Adult	12 months	100 mg daily	300 mg once a month and 50 mg daily	600 mg once a month
		Child (9–14 yrs)	12 months	50 mg daily	1,500 mg once a month and 50 mg daily	450 mg once a month

Q14. Outline briefly the control methods with reference to National Leprosy Eradication Program.
(BNMUB, 2006; TDMGRMU, 2008)

Ans: Different control methods according to national program:

A. **Strengthening diagnosis and treatment of leprosy:** Diagnosis and treatment (multidrug therapy) are provided by all primary health centers and government dispensaries throughout the country at free of cost. Difficult to diagnose and complicated cases and cases requiring reconstructive surgery are referred to district hospital for further management.
- *Diagnosis at block level:* It is done by using clinical classification into the following two groups:
  1. Paucibacillary leprosy: 1–5 hypopigmented patches and/or only one nerve involvement.
  2. Multibacillary leprosy: Six or more hypopigmented patches and/or more than one nerve involvement.
- *Treatment of leprosy:* **WHO recommended MDT of leprosy cases (multibacillary and paucibacillary cases)**

B. **Involvement of ASHA:** Under NRHM a scheme to involve ASHA to find out leprosy cases from their villages for diagnosis at PHC and follow-up cases for treatment completion. To facilitate the involvement of ASHA, they are being paid incentive as below:
- On confirmed diagnosis of case brought by them - ₹ 250.00
- An early case before onset of any visible deformity - ₹ 250.00
- A new case with visible deformity in hands, feet or eye - ₹ 250.00
- On completion of full course of treatment of the cases within specified time - PB leprosy cases ₹ 400.00
- MB leprosy cases ₹ 600.00

C. **Training of different categories of staffs:** Training of general health staffs like medical officers, health workers, health supervisors, laboratory technicians and ASHAs are conducted every year to develop adequate skills in diagnosis and management of leprosy cases. Training of state and district leprosy officers organized at the central and regional leprosy training and research institute.

D. **Involvement of NGOs:** NGOs have been involved in the program for many decades and have provided valuable contribution in reducing the burden of leprosy. NGOs serve in remote, inaccessible, uncovered, urban slums, industrial/labor population and other marginalized population groups. Following activities are undertaken by NGOs:
- IEC and reduction of stigma
- Prevention of impairment and disabilities
- Case detection and referral
- Follow-up for treatment completion.

E. **Information, education and communication (IEC):** Intensive IEC activities are conducted for awareness generation and particularly reduction of stigma and discrimination against leprosy affected persons. Activities are carried through mass media, rural media and advocacy meeting.

F. **Disability prevention and medical rehabilitation (DPMR):** For prevention of disabilities among persons with insensitive hand and foot, they are given dressing materials, supportive medicines and

micro cellular rubber (MCR) footwear. The patients are empowered with self-care procedure for taking care of themselves.

Reconstructive surgery (RCS): More emphasis is given on correction of disability among leprosy affected persons through **RCS.** To strengthen RCS services, government of India recognized 115 institutions for conducting RCS based on the recommendations of state government. Out of them, 61 are government institutions and 54 are NGO institutions. An amount of ₹ 8,000/- is provided as an incentive to each leprosy affected persons for undergoing major reconstructive surgery in identified government/NGO institutions to compensate loss of wages during their stay in hospital. Support is provided to institution (hospital) conducted RCS, ₹ 5,000.00 per RCS for procurement of supply and material and other ancillary logistic expenditure required for surgery. RCS conducted at camps, provided with ₹ 5,000.00 per case and making a total of ₹ 10,000.00 for prevention of disability, dressing materials, medicines and **microcellular rubber (MCR) footwear.**

G. **Urban leprosy control:** To address the complex problems in urban areas, the urban leprosy control activities are being implemented in 422 urban areas having population size more than 1 lakh. These activities include:
- MDT delivery services
- Follow-up patient for treatment completion
- Providing supportive medicines and dressing materials
- Monitoring and supervision.

H. **Monitoring and supervision:** Program is monitored at different levels through:
- New case detection rate
- Treatment completion rate
- Proportion of grade-II disability among new cases
- Field visits by the supervisory officers
- Analysis of monthly progress report and subsequent review

Q15. What is meant by the term "elimination of leprosy"? Discuss the steps for elimination of leprosy. *(BNMUB, 2002; TRIU, 2021; TDMGRMU, 2009; SMU, 2009; DU, 2011; RUJH, 2009; MU, 2019)*

Ans: National leprosy control program was launched in 1955 to achieve leprosy control through early detection of cases and regular sustained dapsone monotherapy. Long duration of treatment and irregular compliance to patients was found. Advent and success of multidrug therapy (MDT) in 1982, the program redesigned as National Leprosy Eradication Program (NLEP) in 1983. With the implementation of MDT, the prevalence of leprosy came down to 57/10,000 in 1983 to 0.95/10,000 in December 2005.

Leprosy case <1 case per 10,000 population is considered as the level of elimination as a public health problem. Thus elimination at national level is achieved.

To strengthen the process of elimination of leprosy in the country, the first World Bank supported project phase I was initiated in 1993 and completed in 2000. Second World Bank supported project phase II was initiated in 2001 and completed by 2004. Since January 2005, NLEP is being carried out through Government of India funds and technical support from WHO and International Federation of Anti-Leprosy Association (ILEP) organization. Consequently, leprosy services have been made available through general health services and **MDT has been made available in all PHCs, sub-centers, dispensaries and hospitals to treat leprosy cases free of cost.**

Objectives for the twelfth plan (2012–2017): The main objectives for the twelfth plan are:
- Limitation of leprosy, i.e., prevalence <1 case per 10,000 populations in all districts of the country
- Strengthen disability prevention and medical rehabilitation of persons affected by leprosy
- Reduction of stigma associated with leprosy.

Strategies adopted: To achieve the objectives the twelfth 5 year plan the strategies proposed are:
- Integrated leprosy services through general healthcare system
- Decentralized planning for achievement of results

- Early detection and complete treatment of new leprosy cases
- Carrying out household contact survey in early detection of cases
- Involvement of ASHA in detection and complete treatment of leprosy cases
- Strengthening of disability prevention and medical rehabilitation (DPMR) services
- IEC activities in the community to improve self-reporting to primary health center
- Intensive monitoring and supervision at PHC and BPHC/CHC level

Different control methods under the national program – answered in Q14.

Q16. Enumerate different modes of intervention under levels of prevention. Discuss in brief, the levels of prevention in relation to leprosy? *(WBUHS, 2008; SAMU, 2004; BNMUB, 2013)*

Ans: Enumeration of different modes of intervention under levels of prevention:

Levels of prevention	*Mode of intervention*
Primary prevention	Health promotion Specific protection
Secondary prevention	Early diagnosis and treatment
Tertiary prevention	Disability limitation and rehabilitation

Levels of prevention in relation to leprosy:

- **Primary prevention of leprosy:**
  - *Health promotion through health education, nutritional intervention, change of life style and behavior and environmental modifications*
    Health education—intensive IEC activities are conducted for awareness generation and particularly reduction of stigma and discrimination against leprosy affected persons. These activities are carried through the followings, etc., mass media, outdoor media, rural media and group approach.
  - *Specific protection:*
    - BCG vaccine administration at birth provides some protection against leprosy.
    - Chemoprophylaxis by single dose of Rifampicin tab
    - Immunoprophylaxis by mycobacterium indicus pranii (MIP) vaccine to family members and contacts can give protection around 60%
- **Secondary prevention of leprosy: Early diagnosis and treatment:** It consists of history and thorough physical examination and investigation.
  Detailed history taking and physical examination, diagnosis on the basis of paucibacillary leprosy and multibacillary leprosy, bacterial index, morphological index multidrug therapy (MDT) recommended by WHO **(Answer from Q13)**
- **Tertiary prevention:** It consists of disability limitation and rehabilitation.

Rehabilitation is an integral part of leprosy control. *(WBUHS, 2019; GOAU, 2021)*

The WHO expert committee on leprosy defined rehabilitation as "**the physical and mental restoration, as far as possible, of all treated patients to normal activity, so that they may be able to resume their place in the home, society and industry.**"

So, rehabilitation is, therefore, an integral part of leprosy control. The cheapest measure to prevent physical deformities and social and vocational disruption by early diagnosis and adequate treatment. The measures that are taken in this direction are known as preventive rehabilitation. The approach to rehabilitation should begin with preventing rehabilitation. We should never allow rehabilitation to take place, if it happens then rehabilitation is an uphill task.

Community-based rehabilitation is a strategy for equal opportunities and social inclusion of all people with disabilities. Community-based rehabilitation is implemented through the combined efforts of the people with disabilities themselves, their families, organizations and communities, and relevant governmental and nongovernmental health, education, vocational, social and other services.

Certain types of deformities can occur in leprosy, particularly in multibacillary leprosy like mask face, leonine facies, loss of eyebrows and eyelashes, corneal ulcer, perforated nose, depressed nose, etc. Claw hand, wrist drop, ulcers, absorption of digits, swollen hand, loss of fingers, etc. Planter ulcer, foot drop, inversion of foot, clawing of the toes and loss of toes, etc.

DPMR: One useful strategy for tertiary prevention is disability prevention and medical rehabilitation. For prevention of disabilities among persons with insensitive hand and foot, they are given dressing materials, supportive medicines and **micro cellular rubber (MCR)** footwear. The patients are empowered with self care procedure for taking care of themselves. Reconstructive surgery is a useful option.

Reconstructive surgery (RCS): More emphasis is given on correction of disability among leprosy affected persons through (RCS).

SHORT NOTES AND RELEVANT QUESTIONS ON LEPROSY

Q13a. A 30-year-old man attends OPD with more than five hypopigmented patches on different parts of the body. Write down the diagnosis. *(WBUHS, 2011; TRUU, 2023)*

Ans: A 30-year-old man attends OPD with more than five hypopigmented patches on different parts of the body. Patches themselves with loss of sensation creates clear clinical doubt of leprosy. The number of patches is an important criterion to diagnose a paucibacillary or multibacillary leprosy case.

Patient is suffering from leprosy, because leprosy is defined if it has one or more of the following cardinal features, (a) hypopigmented patches, (b) partial or total loss of cutaneous sensation, (c) presence of thickened nerve and (d) presence of acid fast bacilli.

As the patient has more than 5 hypopigmented patches, so this is a case of leprosy.

This is a case of multibacillary leprosy, because multibacillary leprosy is defined as if the patient has 5 or more hypopigmented patches.

Q13b. State the different presentation of leprosy to be encountered in outpatient department of hospitals. *(BNMUB, 2006)*

Ans: Different presentation of leprosy:

- Hypopigmented patch in different parts of the body. Thorough inspection of the body surface in good natural light is necessary.
- Thickening of the peripheral and cutaneous nerve and/or tenderness. Commonly involved peripheral nerves are ulnar nerve near medial epicondyle, great auricular nerve, lateral popliteal nerve, dorsal branch of the radial nerve.
- Loss of sensation for heat, cold, pain and light touch in the skin patches.
- Deformities in leprosy referred to **Q13.**

Q13c. Leprosy eradication is very difficult to achieve – justify. *(SMU, 2011)*

Ans: The prevalence of leprosy has been brought down from 57.6 cases per 100,000 population in 1993 to 0.69 per 10,000 population in March 2015, with biannual case detection rate of 9.73 per 100,000 population.

Out of 36 states/UTs, 34 already achieved leprosy elimination status. Chandigarh and Dadra and Nagar Haveli are yet to achieve elimination. Elimination in all districts is the objective of 12th 5-year plan. Number of districts yet to achieve elimination is 118 as on March 2016.

Among the new cases detected in 2014–15, the proportion of MB cases was 51.27%, female cases 38.33%, 8.94% were children, 18.79% were SC, 18.57% ST, 4.60% had Grade II deformity. Grade II disability cases are under-reported. Leprosy cases are more found mostly in urban slums areas.

There are some conditions of some disease which can be eradicated. Disease is seen only among human population. There is no sub-clinical case. No carrier is found. There is very good vaccine against the disease. The germs are not found elsewhere except human. If we see the epidemiology of leprosy, we shall see that

leprosy is a disease which lack all these conditions or criteria. So, this disease cannot be controlled/eliminated as per our whims and also the same is for eradication.

Thus, leprosy eradication is very difficult to achieve.

Q17d. Enumerate indicators that are used by the health workers to assess the disability of leprosy cases in field level. *(MU, 2019)*

Ans: For the assessment of disability of leprosy cases in field level, the following indicators are being used:

- Rate of new cases with grade - 2 disabilities is observed.
- It is expressed in percent.
- It is calculated through percentages of people with grade - 2 disability among new leprosy cases detected during the reported year and for whom a disability assessment was carried out.

$$\textbf{Disability grade - 2 proportion} = \frac{\textbf{Number of new cases with disability grade - 2 in a year}}{\textbf{Total number of new cases detected in that particular year}} \times 100$$

For the first time, this indicator has been included in the current list of core indicators to monitor the progress made against leprosy. When reviewed with other indicator of leprosy, we can have the ideas of control activities.

- Estimate under detection of leprosy cases
- Measure the need for physical and social rehabilitation
- Advocate activities for prevention of disabilities
- Enhance collaboration with other sectors as well

TUBERCULOSIS RELATED QUESTIONS AND ANSWERS

Q18. Discuss the epidemiology of Tuberculosis. *(BNMUB, 2005; TRIU, 2022; RGUHS, 2010; KIMS, 2014; SMU, 2012; YSRUHSAP, 2023; GNSUB, 2023; GOAU, 2022)*

Ans: Epidemiology of tuberculosis: India is the highest TB burden country in the world in terms of absolute number of incident cases that occur each year. It accounts for one-fourth of estimated global incident TB cases in 2013. As per WHO estimation, tuberculosis prevalence per lakh population has reduced from 465 in the year 1990 to 201 in 2013. In absolute numbers, prevalence has reduced from 40 lakhs to 26 lakhs annually. Incidence per lac population has reduced from 216 in year 1990 to 171 in 2013. Tuberculosis mortality has reduced from 38 per lakh population in 1990 to 19 in 2013. In absolute numbers, mortality due to TB reduced from 3.3 lakhs to 2.4 lakhs annually. MDR-TB among notified new pulmonary TB patients was about 2.2% and among retreatment cases was about 15%.

- **Agent:** The disease agent is *Mycobacterium tuberculosis.*
- **Host:** The bacteria of tuberculosis, i.e., *M. tuberculosis* generally infects the person of early age. Young persons are affected by infection and disease is found among productive population.
- **Environment:** Overcrowding, poverty, ill education, high prevalence of the disease in the society are few important issues which help propagation of the disease.

One sputum positive case infects 10–15 individuals in a year. Life time risk of development of disease in a newly infected young child is 10% and half of this risk falls within first 5 years following infection. The risk of progression from latent disease is 110–60% if co-infect with HIV infection. Incidence increases with age. Two peaks in incidence are observed - first in 1–4 years age group and second in adolescents and young adults. The disease in cadence is highest in most economically productive age group of 15–60 years.

The disease is 3–5 times more common in males. Prevalence is similar in rural and urban areas. However, TB is more common in urban slums.

Underweight, strict vegetarian diet and smoking have also identified as risk factors. Alcohol abuse, injecting drug use and malnutrition adversely affect immune system hence could influence development of disease.

Several medical conditions are commonly associated with tuberculosis. For example, risk is 3 times greater in diabetics, 10–15 times greater in those with end stage renal failure than general population. It is also higher among those on corticosteroid treatment.

Q19. Describe various components of DOTS strategy. *(ABKUB, 2007; BNMUB, 2013, 2015, 2019; RGUHS, 2010, 2013, 2024; TRIU, 2013, 2014, 2016; SAMU, 2014, 2015; KIMS, 2014; SMU, 2012; SSUHSA, 2009, 2010, 2012; NU, 2016; SDVPG, 2023; GOAU, 2022)*

Ans: Directly observed treatment short course chemotherapy: Meaning of DOTS is **D**irectly **O**bserved **T**reatment **S**hort course chemotherapy. It is the only strategy which has been documented to be effective world-wide on a program basis. DOTS is a community-based tuberculosis treatment and care strategy which combines the benefits of supervised treatment.

Various components of DOTS strategy:

Components	Strategies
Political and administrative commitment	The government's commitment is measured in terms of continued financial assistance, human resources and administrative support
Quality assured diagnosis through sputum smear microscopy	Sputum smear microscopy is the primary tool for detection of infectious TB cases, facilitating categorization of treatment and an objective method for monitoring the response to treatment
Uninterrupted supply of good quality drugs	The policy of procurement and distribution of drugs ensures sufficient quality assured anti-TB drugs available at all levels. The unique feature of RNTCP is the use of blister combination-packs in patient wise drug boxes for adults and weight band wise drug boxes for pediatric cases which contain drugs for entire course of treatment
Directly observed treatment (DOT)	In DOT, an observer watches and supports the patient in taking their drugs
Systematic monitoring and accountability	A standardized recording and reporting structure which allows for rigorous monitoring and evaluation of the outcome of every patient put under treatment is essential. In RNTCP, key indicators like case detection rate, cure rate and sputum conversion rate are monitored regularly at every level of the health system

Q20. Write in brief about National Program on Control of Tuberculosis in India in the context of RNTCP and NTEP. *(WBUHS, 2023; BNMUB, 2016, 2022; TRIU, 2022; NU, 2016; KIMS, 2019, 2023; SSUHSA, 2021; SDVPG, 2023; GNSUB, 2023)*

Ans: National Tuberculosis Program of India (NTP) was initiated in 1962 and was designed for domiciliary treatment using self-administered standard drug regimens. No appreciable change in the epidemiological situation of TB in the country had been observed despite the NTP being in existence since 1962.

In 1992, Government of India (GOI), WHO and SIDA reviewed the performance of the NTP. The observations revealed on NTP were:

- Though NTP technically sound, suffered from managerial weakness
- Inadequate fund
- Over reliance on X-ray diagnosis
- Frequent interrupted supplies of drugs
- Low treatment completion rate

In 1993, GOI decided a new thrust in TB control activities with the assistance from international agencies by revitalizing the NTP and the Revised National Tuberculosis Control Program (RNTCP) was piloted in a population of 2.5 million and later expanded to 13 million people by 1995 and 20 million by 1996.

In 1997, RNTCP was launched as a national program with a plan to scale up in phased manner. Thus, RNTCP adopted the internationally recommended 'directly observed treatment short-course treatment' (DOTS) strategy as the most systematic and cost-effective approach.

The strategies of DOTS are:

a. Political and administrative commitment
b. Reliable and early diagnosis through smear microscopy
c. An uninterrupted supply of good quality anti-TB drugs through patient wise boxes (PWBs)

d. Effective and patient friendly treatment with direct observation
e. Proper recording and reporting, supportive supervision and accountability

Goals of RNTCP: Reduce mortality and morbidity from TB and interrupt chain of transmission.

Objectives of RNTCP:

1. To achieve and maintain cure rate at least 85% of newly detected infectious cases of pulmonary tuberculosis (new sputum smear-positive).
2. To achieve and maintain detection of such cases at least 70% of the estimated new smear positive pulmonary tuberculosis.

Major addition in RNTCP over NTP were:

- Establishment of sub-district supervisory postknown as a TB unit
- Dedicated RNTCP supervisors posts
- Decentralized diagnostic and treatment services
- Treatment supported by DOT providers

The entire country was covered under the program by the end of 2005 (March 2006).

In September 2000, Millennium summit was held in New York with the representatives from 189 countries. In this world summit eight millennium development goals were formulated. These goals have to be achieved by 2015.

The goal 6 of MDGs was to combat HIV, malaria and other diseases that included a target of halt by 2015 and begin to reverse the incidence of those diseases. The monitoring indicators for tuberculosis were:

1. Incidence, prevalence and death rates associated with tuberculosis
2. Proportion of smear positive pulmonary tuberculosis cases detected and cured under DOTS.

The stop TB strategy from 2006–2015: In the year 2006, WHO released stop TB strategy with six principal components in TB related MDGs by 2015.

1. Pursuing high-quality DOTS expansion and enhancement
2. Addressing TB/HIV, MDR-TB and other challenges
3. Contributing to health system strengthening
4. Engaging all care providers
5. Empowering people with TB and communities
6. Enabling and promoting research

Targets in relation to stop TB partnership and MDGs were:

- By 2015: Reduction of TB prevalence and death rates by 50% relative to 1990.
- By 2050: Elimination of TB as a public health problem.

Sustainable development goals in relation to TB

Though progresses were made in MDGs till major challenges to meet, post-2015 development agenda was adopted in 25th September 2015 in New York, **"Transforming our world: the 2030 agenda for sustainable development."** Seventeen sustainable development goals (SDGs) and 169 targets were announced. As MDGs came to the end of the term, SDGs officially started from 1st January 2016.

Of the 17 SDGs, Goal 3 dealt with health which "ensure healthy lives and promote well-being for all at all ages." The target of 3.3 is concerned with tuberculosis - "By 2030, end of epidemic of AIDs, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases and communicable diseases."

The End TB strategy: *(AKUB, 2022; TRIU, 2023; VBUJH, 2023)*

World Health Organization announced a new strategy in 2014, End TB strategy to fight against tuberculosis. In the End TB strategy, four barriers were identified to achieve progress in the fight against TB. They are:

1. Weak health system
2. Underlying determinants of TB such as poverty, undernutrition, migration, ageing population and risk factors such as diabetes, silicosis and smoking
3. Lack of effective tool
4. Continuous unmet funding needs

Vision is a TB-free world:

Goal: To dramatically reduce the global burden of TB by 2015 in line with the millennium development goals and the stop TB partnership targets.

Objectives:
- Achieve universal access to high-quality care for all people with TB
- Reduce the human suffering and socioeconomic burden associated with TB
- Protect vulnerable populations from TB, TB/HIV and multidrug-resistant TB
- Support development of new tools and enable their timely and effective use
- Protect and promote human rights in TB prevention, care and control

Principles:
- Government commitment and accountability with monitoring and evaluation
- Coordination with civil society organizations and communities
- Protection and promotion of human rights, ethics and equity
- Adaptation of the strategies, targets at country level with global collaboration

Targets: Reduction in number of TB deaths compared with 2015 (in percent) is 35%, 75%, 90% and 95% in 2020, 2025, 2030 (SDGs) and 2035 (end TB) respectively.

Reduction in TB incidence rate compared with 2015 (in percent) is 20%, 50%, 80% and 90% in the consequent years given above.

No family should face extra burden with catastrophic expenses.

The global strategies and targets were endorsed by all member countries at 2014 World Health Assembly for tuberculosis care, prevention and control.

Pillars of RNTCP:

A. **Integrated patient centered care and prevention**
B. **Bold policies and supportive systems**
C. **Intensified research and innovation**

Strategic planning of RNTCP: Government of India launched a comprehensive national strategic plan (NSP) under 12th 5 year plan (2012–2017). The theme of NSP is **"Universal access for quality diagnosis and treatment for all TB patients in the community" with a target of "reaching the unreached."**

The following thrust areas were identified:
- Strengthening and improving the quality of basic DOTS services
- Further strengthening and align with health system under NRHM
- Decentralized rapid diagnosis
- Promote research for development
- Expand efforts to engage all care providers
- Strengthen urban TB control through municipal cooperation
- Expand diagnosis and treatment of drug resistance TB
- Improve communication and out-reach area
- Implementation of improved tools and strategies

The objectives of the program in the proposed twelfth Plan:
- Early detection and treatment of at least 90% of the estimated all types of TB cases in the community including drug resistance and TB with HIV.
- Successful treatment of at least 90% of new TB patients, and at least 85% of previously treated TB patients.

The **National Tuberculosis Elimination Program (NTEP)** is the **Public Health** initiative of the **Government of India** that organizes its antituberculosis efforts. It functions as a flagship component of the **National Health Mission (NHM)** and provides technical and managerial leadership to antituberculosis activities in the country. As per the national strategic plan 2012–17, the program has a vision of achieving a **"TB free India"**, and aims to provide Universal Access to TB control services. The program provides various

free of cost, quality tuberculosis diagnosis and treatment services across the country through the government health system.

National TB Elimination Program—NTEP (2020-till date): Consolidating a series of rapid and progressive advancements in RNTCP from 2016 onward, and with government of India's commitment to achieve the END TB targets 5 years earlier, RNTCP was re-named as the **National TB Elimination Program** (NTEP) the **change came into effect from 1st January 2020.** This decision was declared by Special Secretary, Sanjeeva Kumar, Ministry of Health and Family Welfare, in a letter to all the State Chief Secretaries.

Q21. Write in brief about revised national tuberculosis elimination program including new initiatives in Bihar or any state of India. *(BNMUB, 2016)*

Ans: Organizational structure: The program is managed through a four level hierarchy from the national level down to the sub-district (tuberculosis unit) level.

A. **National level:** The program is led by the central TB division under the Ministry of Health and Family Welfare - Deputy Director General - TB (DDG-TB)

B. **State level:** State TB officer, state TB capacity building officer, medical officer, accounts officer, drug supply and procurement officer, data entry officer, WHO consultant

C. **District level:**

Designation	No
District tuberculosis officer	1
Medical officer	1
Laboratory technician	1
X-ray technician	1
District TB HIV and DOTS plus supervisor	1
Statistical assistant	1
Data entry operator	1

Urban area TB health visitor (TBHV) for 1 lakh population

D. **Sub-district/Block level:**

Sub-district level: There is a tuberculosis unit (TU) at sub-district level covering a population of 5 lakhs (2.5 lakhs in tribal, desert and hilly areas). TU can be located at CHC or block hospital. It is responsible for TB control activities in the area including monitoring and supervision of DMCs, DOT centers and PHIs.

Designation	No
MO-TC	1
STS	1
STLS	1
LT	1

MO-TC will be 1 in number in one TU. STS maintain TB register, prepare quarterly reports and plays an important role in treatment supervision. STLS is responsible for maintenance of laboratory services in the area also supervise 5 microscopy centers, he rechecks all positive slides and 10% of negative slides of the 5 MCs.

Designated microscopy centers (DMC): Designated microscopy centers are located at health centers, dispensaries or equivalent private and NGO facilities. It caters **one lakh population** but in hilly, tribal and difficult areas **50,000 population.** Its laboratory technician is trained in RNTCP. It provides sputum microscopy services in the area. DMC can also be located in medical colleges, corporate hospitals, ESI hospitals, railway hospitals, NGOs and private hospitals or nursing homes, etc.

DOT center: DOT centre can be located at a facility run by government, private and NGOs. This center is used to provide directly observed treatment to patients at a place convenient to them. **Anybody including**

Family members of a TB patient can be a DOTS provider, e.g., health workers, private practitioners, AWWs and ASHA. The honorarium for provision of DOT will be paid to such workers who are not salaried employees of State/Central government.

TB patients in tribal and difficult areas get ₹ 750/-.

Very recently under Nikshay Poshan Yojana all notified TB patients are provided with an incentive of ₹ 500/- for nutritional supports.

Eligibility: All TB patients (including all existing) will be notified from April 2018 (2014) onwards. Patient must be registered and notified in the Nikshay Portal.

Benefit: Financial incentive Rs 500/- (₹ 3,000.00) for the duration of anti-TB treatment

Direct beneficiary transfer (Aadhar enabled bank account) is done or incentive may be transferred to near relative with patient declaration.

Under NTEP, incentives are provided to treatment providers after completion of treatment as follows:

- **Category I: ₹ 1,000/- per patient**
- **Category II: ₹ 1,500/- per patient**
- **MDR, XDR TB: ₹ 5,000/- per patient**

Peripheral health institutions (PHIs): As per NTEP, a PHI is a health facility which is manned by at least a medical officer (MO). As per norms, dispensaries, PHCs, CHCs, referral hospitals, major hospitals, specialty clinics, TB hospitals, medical college in the respective district and health facilities like private and NGO sectors participating in RNTCP are considered as PHIs. Some of the PHIs also function as DMCs. PHIs undertake tuberculosis case finding and treatment activities as a part of general health services.

Public-private partnership: Private sector, NGOs and private practitioners are actively involved for case detection and treatment of patients under RNRCP. Many NGOs are coming forward in public-private mix project like running of TU, acts as DMC and PHIs.

Some of the notable organizations are Indian Medical Association (IMA), World vision India, program for appropriate technology in health (PATH), etc.

Involvement of medical colleges: Under NTEP, medical college plays an important role in service delivery, advocacy and training. Faculty members of medical colleges are trained on RNTCP guidelines and some of them are master trainers. Few designated medical colleges act as DRTB centers around the country. For example, CBNAAT machines are installed in medical colleges to cater greater population.

Quality assured laboratory services (laboratory network of NTEP) *(WBUHS, 2016)*

Three-tier sputum microscopy centers are available in NTEP:

- National level - National reference laboratories (NRLs)
- State level - Intermediate reference laboratories (IRLs)
- Peripheral level - Designated microscopy centers (DMCs)

An in-built routine system has been developed for quality assurance in sputum microscopy. External quality assessment (EQA) is done by STLS in TU areas and NRI and IRL in higher levels.

On-site evaluation at DMCs: The STLS rechecks slides on monthly basis in an un-blind manner on his evaluation visits. Five (5) positive (total positives) and five (5) negative (total negatives) slides are selected from laboratory register in a systematic random sampling method.

Random blinded re-checking of routine slides (RBRC) for DMC: This activity is performed once a month for every DMC.

- The sample contains a sufficient number of randomly selected slides to be representative of all slides of the DMC.
- The supervisor (STLS) of the laboratory (first controller) must not be aware of the original result of peripheral laboratory technician to prevent bias, i.e., results are blinded.
- Discrepant results are resolved by second controller (umpire)
- Timely periodic feedback is the most important aspect of RBRC

Panel testing: Panel testing is a method of EQA. This is used to determine whether a laboratory technician can adequately perform AFB smear microscopy. This method evaluates individual performance in staining and reading

Panel testing under RNTCP is used for supervisory lab staff of STDCs/ILRs/DMC and will be conducted under the supervision of the visiting lab team during their on-site evaluation visit. A panel will consist of 10 unstained smears per laboratory personnel.

Availability of cartridge-based nucleic acid amplification test (CBNAAT) helps in diagnosis of TB as well as Rifampicin resistance from the sputum specimen as well as specimen from extrapulmonary sites. The test is fully automated and provides results within 2 hours.

Treatment services: Fixed dose combination (FDC) as per weight bands from 2018 onwards.

Q21a. Policy updates and new initiatives. *(ABKUB, 2023; TRIU, 2022; MU 2020)*

Ans: **New initiatives:** NIKSHAY, the web-based reporting for TB program has been another notable achievement initiated in 2012 and has enabled capture and transfer of individual patient data from the remotest health institutions of the country.

- **Nikshay:** It has following components: *(KIMS, 2020)*
  - Master management
  - User details
  - Patient registration, diagnosis, DOT provider, HIV status, follow-up contract tracing outcomes
  - Details of solid and liquid culture and DST, LPA, CBNAAT
  - DRTB patients
  - Referral and transfer of patients
  - Private health facility registration and TB notification
  - Mobile application for TB notification
  - SMS alerts for patients on registration and program officer
  - Automated periodic reports
  - Case finding, sputum conversion and treatment outcome

  The program has started using IT enabled adherence tools like **99 DOTS** for HIV-TB patients. This will be expanded to all TB patients with the implementation of daily regimen.
- TB notification: It is now mandatory to notify each and every TB cases to the local authorities, district health officer/municipal health officer every month in a fixed format.
- Ban on TB serology, based on antibody
- Direct benefit transfer schemes
- Rapid diagnosis with CBNAAT
- Daily regimen for pediatric TB
- Daily regimen for all forms of TB in the country
- Pilots for universal access to TB cases
- FDC for all categories of TB patients (adult and pediatric TB cases) as per weight band
- First line and 2nd line DST
- Introduction of new drugs Bedaquiline (BDQ) and conditional use of Delamanid (DLM)
- TB-HIV coordination

Q22. What are the cardinal symptoms for diagnosis of pulmonary tuberculosis? How will you organize tuberculosis control program in a primary health center area?

(WBUHS, 2022; BNMUB, 2002; KIMS, 2014; SMU, 2012)

Ans: The **cardinal symptoms for diagnosis of pulmonary tuberculosis** are cough for more than 2 weeks, chest pain, hemoptysis, fever (evening rise of temperature), night sweats, loss of appetite and weight loss. Presumptive pediatric TB refers to children with persistent fever and/or cough for more than 2 weeks, loss of weight*/no weight gain and/history of contact with infectious TB cases**.

*History of unexplained weight loss or no weight gain in past 3 months; loss of weight is defined as loss of more than 5% body weight as compared to height and weight recorded in last 3 months.
** In a symptomatic child, history of contact with a person with any form of active TB within the last 2 years may be significant.

Revised tuberculosis control program in a primary health center area is being organized in the following manner. Tuberculosis unit (TU), designated microscopy centers (DMCs), DOT center - **Answer from Q21.**

Q23. Describe the diagnostic process for initiation of treatment of TB under NTEP. Write down diagnostic algorithm for TB, daily dose schedule (FDC) for adults as per weight band. *(WBUHS, 2019, 2022; AKUB, 2022; BNMUB, 2013, 2017; ABKUB, 2007; RGUHS, 2013; TRIU, 2014, 2016, 2023; SAMU, 2014, 2015; SSUHSA, 2010, 2012; KIMS, 2014, 2024; BUMP, 2013; MU, 2022; VBUJH, 2022)*

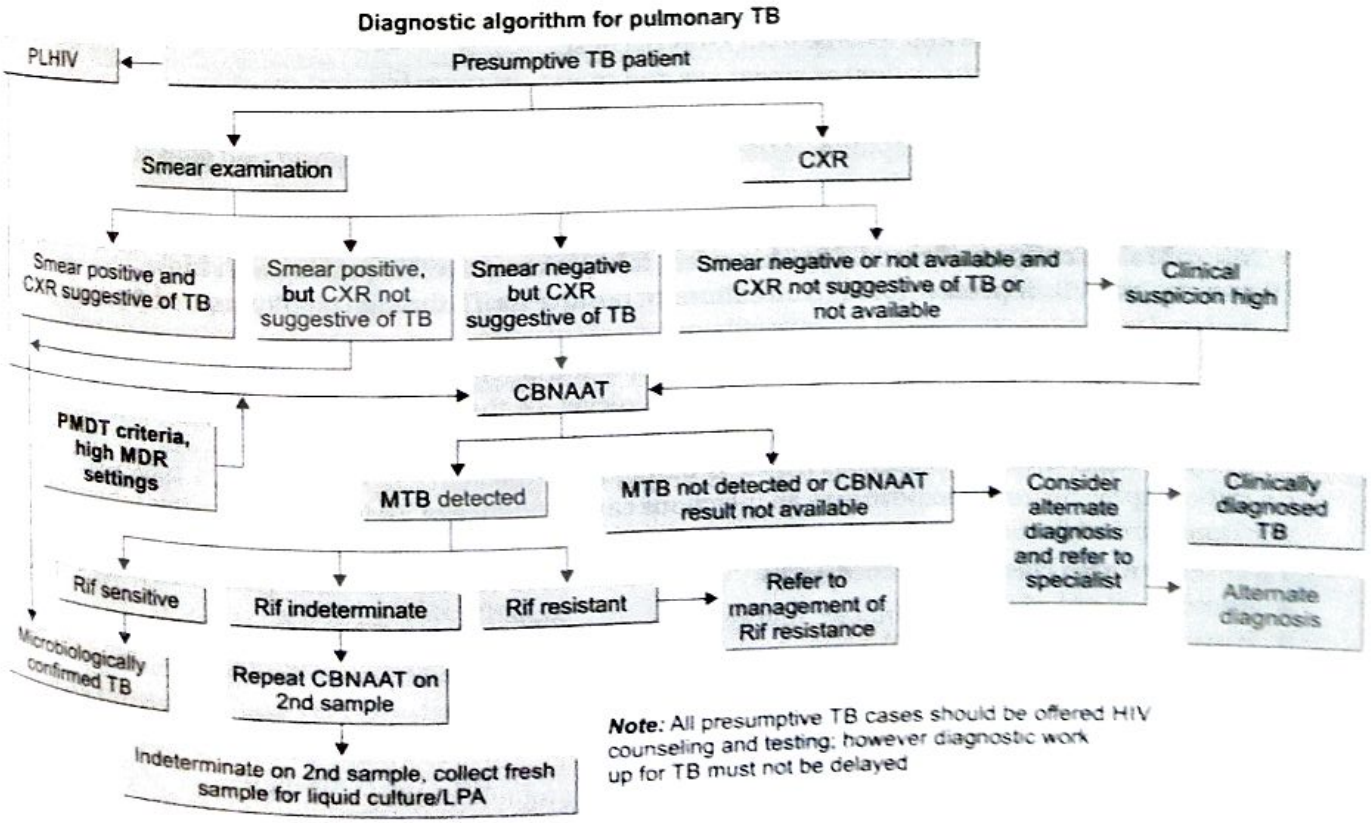
Ans: Testing for TB: Any person with symptoms and signs suggestive of TB including cough >2 weeks, fever >2 weeks, significant weight loss, hemoptysis, etc., and any abnormality in chest radiograph must be evaluated for TB.

Children with persistent fever and/or cough >2 weeks, loss of weight/no weight gain, and/or contact with pulmonary TB cases must be evaluated for TB.

Screening for TB:

- People living with HIV (PLHIV), malnourished, diabetics, cancer patients, patients on immunosuppressant or maintenance steroid therapy, should be regularly screened for signs and symptoms suggestive of TB.
- Enhanced case finding should be undertaken in high-risk populations such as healthcare workers, prisoners, slum dwellers, and certain occupational groups such as miners. **Sputum examination is the mainstay with judicious use of chest X-ray and CBNAAT.**

For TB evaluation, the following steps are followed which are given here as algorithm.



Collection of sputum sample in tuberculosis *(RGUHS, 2014)*

A patient who is reporting to the health facilities, two samples of sputum will be examined under microscope if his/her symptoms are suggestive of tuberculosis. Of the two samples one is spot and another one is early morning.

Technique for sputum collection from adult:

- Inhaling deeply 2–3 times
- Cough out deeply from the chest
- Open the container, bring it close to mouth and bring the sputum out into it.
- No saliva or nasal secretion should be given and then container should be closed.
- This procedure should be carried out in an open space and no one standing in front of the patient. Fan should be switched off and window will remain open in room collection.
- Patient should be instructed to empty bowel and bladder before starting the procedure.

Technique for sputum collection from children:

- Sputum can be collected from even very young children by inducing cough and sputum production with nebulized saline or bronchodilators and then asking the patient to expectorate the sputum or suctioning the back of the pharynx to collect sputum.
- Gastric aspiration
  - Gastric aspiration is the classic method of collection in children.
  - Gastric aspirates are collected in the morning and after an overnight fast.
- Bronchoalveolar lavage
  - Bronchoalveolar lavage (BAL) is particularly helpful in patients in whom the cause of pulmonary disease or infection is not known.

Advantages:

- Easy, cheap, simple, reliable, practical and confirmatory diagnostic test
- It helps in assessing the progress of the disease
- It helps in identify infectious cases
- This is more objectives and reliable than X-ray of chest
- It helps to categorize the patient as smear +ve and smear –ve cases (clinical case).
- Thus, it facilitates appropriate treatment.

Significance: Examination of sputum is the first-line of investigation and considered **gold standard test in diagnosis of adult tuberculosis.**

Case definitions:

- **Microbiologically confirmed TB:** This refers to a presumptive TB patient with biological specimen positive for AFB, or positive for MTB on culture, or positive for TB through quality assured rapid diagnostic molecular test.
- **Clinically diagnosed TB case:** This refers to a presumptive TB patient who is not microbiologically confirmed, but diagnosed with active TB by a clinician on the basis of X-ray, histopathology or clinical signs with a decision to treat the patient with a full course of anti-TB treatment.

In children, clinical diagnosis of TB case is based on the presence of abnormalities consistent with TB on radiography, history of exposure to an infectious case, evidence of TB infection (positive tuberculin skin test) and clinical findings suggestive of TB in the event of negative or unavailable microbiological results.

TB cases are also classified according to:

- Anatomical site of disease
- History of previous treatment
- Drug resistance
- HIV status

Classification by anatomical site of disease:

- **Pulmonary tuberculosis (PTB):** This refers to any microbiologically confirmed or clinically diagnosed case of TB involving lung parenchyma or tracheobronchial tree.

- **Extrapulmonary tuberculosis (EPTB):** This refers to any microbiologically confirmed or clinically diagnosed case of TB involving organs other than lungs, e.g., pleura, lymph nodes, intestine, genitourinary tract, joint and bones, meninges of the brain, etc. **Miliary TB classified as PTB because there are lesions in the lungs. A patient with both pulmonary and extrapulmonary TB should be classified as a case of PTB.**

Classification by H/O previous TB treatment:

- **New case:** A TB patient who has never had treatment for TB or has taken anti-TB drugs for <1 month. Previously treated patients have received 1 month or more of anti-TB drugs from any source in the past.
- **Recurrent TB case:** A TB patient previously declared as successfully treated (cured/treatment completed) and is subsequently found to be microbiologically confirmed TB case (These were previously known as relapse patients).
- **Treatment after failure patients:** Those patients who have previously been treated for TB and whose treatment failed at the end of their most recent course of treatment.
- **Treatment after lost to follow-up:** TB patient previously treated for TB for 1 month or more and was declared lost to follow-up in their most recent course of treatment and subsequently found to be a microbiologically confirmed TB case (These were previously known as treatment after default patients).
- **Other previously treated patients:** Those who have previously been treated for TB but who cannot be classified into any of the above classification.
- **Transferred in:** A TB patient who has been received for treatment in a TU after starting treatment in another TB unit where he/she has been registered is considered as transferred in.

Classification based on drug resistance:

- **Mono-resistant (MR):** A TB patient, whose biological specimen is resistant to one first-line anti-TB drug only.
- **Polydrug resistant (PDR):** A TB patient, whose biological specimen is resistant to more than one first-line anti-TB drug, other than both INH and Rifampicin.
- **Rifampicin resistant (RR):** Resistance to rifampicin detected using phenotypic or genotypic methods, with or without resistance to other anti-TB drugs excluding INH. Patients who have any Rifampicin resistance, should also be managed as if they are an MDR TB case.
- **Multidrug resistant (MDR):** A TB patient, whose biological specimen is resistant to both isoniazid and rifampicin with or without resistance to other first-line drugs, based on the results from a quality assured laboratory.
- **Extensively drug resistant (XDR):** A MDR TB patient whose biological specimen is additionally resistant to a fluoroquinolone (ofloxacin, levofloxacin, or moxifloxacin) and a **second-line injectable anti-TB drug** (kanamycin, amikacin, or capreomycin) from a quality assured laboratory.

Treatment regimen: For all TB patients whether being treated in public or private sector, clinicians should follow standards for TB care in India **(STCI)** guidelines. In NTEP, the principle of treatment for tuberculosis (other than confirmed drug resistant forms of TB) is to administer daily fixed dose combinations of first-line antituberculosis drugs in appropriate weight bands. For patients being treated in private sector, FDCs may be provided by NTEP whenever requested.

Q243. Regimen for drug-sensitive TB (DSTB) cases: 2HRZE/4HRE *(KIMS, 2023)*

Ans: This regimen is for H and R sensitive TB cases and cases with unknown sensitivity pattern.

Treatment is given in two phases:

1. **Intensive phase (IP) consists of 8 weeks (56 doses)** of isoniazid (H), rifampicin (R), pyrazinamide (Z) and ethambutol (E) given under direct observation in daily dosages as per weight band categories.
2. **Continuation phase (CP),** consists of **16 weeks (112 doses)** of isoniazid, rifampicin and ethambutol in daily dosages. Only pyrazinamide will be stopped in the continuation phase. **The CP may be extended by**

12–24 weeks in certain forms of TB like CNS TB, Skeletal TB, Disseminated TB, etc., based on clinical decision of the treating physician on case to case basis. Extension beyond 12 weeks should only be on recommendation of specialists.

	IP	CP
Regimen for	Doses	Doses
Drug sensitive TB	56	112

Loose drugs could be used as substitutions in case of adverse drug reaction or with comorbid conditions. Steroids as an adjunctive therapy is useful in patients with TB pericarditis and meningeal TB with an initial high dose tapered downwards gradually over 6–8 weeks.

Type of TB case	Treatment regimen in IP	Treatment regimen in CP
New and previously treated cases (H and R sensitive/unknown)	2 HRZE	4 HRE

Note: Prefix to the drugs stands for number of months

Fixed dose combinations: (DBRAIA 2024)

Fixed dose combinations (FDCs) refer to products containing two or more active ingredients in fixed doses used for a particular indication (s).

In NTEP, for adults: 4-FDC (given in IP) consists of HRZE and 3-FDC (given in CP) consists of HRE.

For pediatric patients: Dispersible 3 FDC consists of HRZ and dispersible 2 FDC consists of HR.

Advantages of FDCs:

- Simplicity of treatment
- Increased patient acceptance
  - Fewer tablets to swallow
  - Prevents 'concealed' irregularity
- Increased health worker compliance
  - Fewer tablets to handle, hence quicker supervision of DOT
- Easier drug management
- Reduced use of monotherapy
  - Lower risk of misuse of single drugs
- Lower risk of emergence of drug resistance
- Easier to adjust dosages by body weight

Drug dosages for first-line anti-TB drugs:

Drugs	Adult	Children	Maximum in children (mg)
Isoniazid	5 mg/kg daily (4 to 6 mg/kg)	10 mg/kg daily (7–15 mg/kg)	300
Rifampicin	10 mg/kg daily (8 to 12 mg/kg)	15 mg/kg daily (10–20 mg/kg)	600
Pyrazinamide	25 mg/kg daily (20 to 30 mg/kg)	35 mg/kg daily (30–40 mg/kg)	2,000
Ethambutol**	15 mg/kg daily (12 to 18 mg/kg)	20 mg/kg daily (15–25 mg/kg)	1,500
Streptomycin*	15 mg/kg daily (15 to 20 mg/kg)	20 mg/kg daily (15–20 mg/kg)	1,000

*Streptomycin is administered only in certain situations, like TB meningitis or if any first-line drug needs to be replaced due to adverse drug reaction (ADR) as per weight of the patient.

** Ethambutol is given separately for children to monitor ophthalmic ADR.

Q23b. Daily dose schedule for adults (as per weight bands).

Weight category	Number of tablets (FDCs)	
	Intensive phase (HRZE)	Continuation phase (HRE)
25–34	75/150/400/275	75/150/275
	2	2
35–49	3	3
50–64	4	4
65–75	5	5
>75	6	6

During treatment if the weight of the patient increases by more than 5 kg and crosses the next weight band category then patient should be given the next higher weight band FDC drugs.

Treatment of pediatric TB: Pediatric cases are to be treated under NTEP in daily dosages as per 6 weight band categories. All adolescents up to 18 years of age and weighing less than 39 kg, are to be treated using pediatric weight bands and children weighing more than 39 kg with adult weight bands.

Key product information (for pediatric):

- **Dispersible FDC, flavored:**
  - Rifampicin 75 mg + Isoniazid 50 mg + Pyrazinamide 150 mg
  - Rifampicin 75 mg + Isoniazid 50 mg
- **Dispersible loose drugs:**
  - Ethambutol 100 mg
  - Isoniazid 100 mg

Q23c. Drug dosage for pediatric TB.

Weight category	Number of tablets (dispersible FDCs)			
	Intensive phase		Continuation phase	
	HRZ	E	HR	E
	50/75/150	100	50/75	100
4–7 kg	1	1	1	1
8–11 kg	2	2	2	2
12–15 kg	3	3	3	3
16–24 kg	4	4	4	4
25–29	3 +1A*	3	3 +1A*	3
30–39	2 + 2A*	2	2 + 2A*	2

A* = Adult FDC (HRZE = 75/150/400/275; HRE = 75/150/275). It is added in higher weight band categories, i.e., >25 kg as these children may be able to swallow tablets.

- Change in weight bands to be effective upon crossing of weight bands irrespective of the quantum of weight gain/loss.
- Pyridoxine may be given at a dosage of 10 mg per day to all children receiving INH containing therapy irrespective of age group.

Operational guidelines for treatment initiation:

- **Initiation of appropriate regimen**
- **Clinical evaluation**

- **HIV testing**
- **Assessment of socioeconomic status**
- **Open a treatment card**
- **Plan appropriate treatment adherence and monitoring mechanism**
- **Drugs**
- **Arrange for follow-up**
- **MO**
- **Arrange for public action**
- **Clinical examination**

Q23d. Drug schedule for multidrug resistance/rifampicin resistance TB cases. *(KIMS, 2021, 2024)*

Ans: Under NTEP, the following are the standard DRTB regimens:

- All oral H mono/Poly DRTB regimen
- Shorter MDR-TB regimen
- All oral longer MDR-TB regimen

Standard regimen for initiating treatment of MDR/RR TB or H mono-poly DR TB

Regimen class	*Intensive phase*	*Continuation phase*
H mono/Poly DRTB (R resistance not detected and H resistance)		
All oral H mono/Poly DRTB regimen*	(6) Lfx R E Z	
MDR/RR TB		
Shorter MDR TB regimen**	(4–6) Mfx Km/Am Eto Cfz Z H E	(5) Mfx Cfz Z E
All oral longer MDR-TB regimen***	(18–20) Bdq (6) Lfx Lzd Cfz Cs	

If the intensive phase is prolonged, the injectable agent is only given three times a week in the extended intensive phase.
Reduced Lzd to 300 mg/day after 6–8 months.
Pyridoxine to be given to all DRTB patients as per weight band

Note:
*All oral H mono/Poly DRTB regimens are of 6 months with no separate IP/CP.
**Shorter MDR-TB regimens are 9–11 months with 4–6 months of IP containing injectables and 5 months of CP. If the IP is prolonged, the injectable is only given three times a week in the extended IP.
***All oral longer MDR-TB regimens are of 18–20 months with no separate IP/CP.
Newer drugs like Bdq and Dlm would be given for 6 months duration while the dose of Lzd will be tapered to 300 mg after the initial 6–8 months of treatment.
This regimen will also be used for treatment of XDR TB patients with 20 months duration.
(Lfx: Levofloxacin; R: Rifampicin; E: Ethambutol; Z: Pyrazinamide; Mfx: Moxifloxacin; Km: Kanamycin; Am; amikacin; Eto: Ethionamide, Cfz: Clofazimine; H: INH; Bdq: Bedaquiline; Dlm: Delamanid; Lzd: Linezolid; Cs: Cycloserine; Cm: Capreomycin)

Treatment should be initiated by trained medical officer. Treatment process initiated in peripheral health institution (PSI) caters patients of known residential area. In some cases, the patients may be admitted in designated TB hospitals or medical colleges. All TB patients are offered quality assured anti-TB drugs under NTEP.

Hence, the clinicians who refer to the presumptive TB/drug resistance TB case should be traced immediately. If the patient is not residing the service area where diagnosis then immediately refer the patients to the appropriate facility where the patient would undergone monitoring of treatment till the feedback received from 1st referral center. In any case, treatment initiation should not be delayed.

Q24. Discuss briefly the different levels of prevention and mode of interventions as applied to pulmonary tuberculosis. *(WBUHS, 2014; KIMS, 2014; DU, 2010; RUJH, 2011)*

Ans: Different modes of intervention under levels of prevention in respect of tuberculosis are given below:

Levels of prevention	Mode of intervention
Primary prevention	Health promotion Specific protection
Secondary prevention	Early diagnosis and treatment
Tertiary prevention	Disability limitation Rehabilitation

Levels of prevention in relation to tuberculosis:

- **Primary prevention of tuberculosis:**

  Health promotion: The health promotion is "the process of enabling people to increase control over health and to improve health". The well-known interventions in this area are health education, nutritional interventions, environmental modifications and change of life styles and behavior changes.

  - *Health education:* Intensive IEC activities are conducted for awareness generation and particularly reduction of stigma and discrimination against tuberculosis affected persons. These activities are carried through mass media, outdoor media, rural media, group approach, etc.
  - *Nutritional interventions:* Poor quality of food, poor quantity of food, poor housing (careless food preservation), population explosion (poor food supply), undernutrition, smoking (loss of appetite), alcohol abuse (loss of appetite), lack of education (poor quality diet intake, lack of awareness of causes of illness), large families (maldistribution of food), early marriages (vicious undernutrition cycle), etc., are the nutrition related issues.
  - *Environmental modifications:* Overcrowding, poverty, high prevalence of the disease in the society are few important issues which help propagation of the disease.
  - *Change of life styles and behavior changes:* Tuberculosis is transmitted mainly by droplet infection and droplet nuclei generated by sputum positive patients with pulmonary tuberculosis. Coughing generates the largest number of droplets of all sizes. The frequency as well as vigor of cough and the ventilation of the environment influence transmission of infection. The time from receipt of infection to the development of a positive tuberculin test ranges from 3 to 6 weeks. Development of disease depends upon the closeness of contact, extent of the disease and sputum positivity of source. Thus the incubation period may be weeks, months or years.

  Specific protection: BCG vaccine administration at birth to one year child to protect the child against severe forms of childhood tuberculosis. As for example, TB meningitis and military TB.

- **Secondary prevention of tuberculosis: Early diagnosis and treatment**
  - Diagnosis consists of history and thorough physical examination and investigation
  - Diagnosis of TB in NTEP as per algorithm
  - Treatment as per FDC **(refer Q.23)**
- **Tertiary prevention of tuberculosis:** It consists of disability limitation and rehabilitation.
  - *Disability limitation:* Approximately 70% all active cases of tuberculosis are pulmonary tuberculosis. For chronic tuberculosis infection, the lung functions are severely impacted. In those cases, the affected person should be eligible for disability benefit under the factory act.
  - *Rehabilitation:* As the success achieved in treating patients through domiciliary lines without interfering with their normal work and life, the proportion of patients who need rehabilitation and work under sheltered condition is very less. However, rehabilitation is required to those who are chronically ill and still excreting tubercle bacilli and patient with lung resection cases to suit their physical and mental abilities.

SHORT NOTES AND RELEVANT QUESTIONS ON TUBERCULOSIS

Q25a. Common side effects of 1st line antitubercular drugs.

Ans:

Name of the drugs	*Side effects*
Rifampicin	Hepatoxicity, gastritis, thrombocytopenia, nephrotoxicity, red color urine
Isoniazid (INH)	Peripheral neuropathy, blood dyscrasias, hyperglycemia
Streptomycin	Vestibular damage, nystagmus, renal damage
Pyrazinamide	Hepatoxicity, hyperuricemia
Ethambutol	Retrobulbar neuritis

Q25b. Passive surveillance in tuberculosis. *(TDMGRMU, 2009)*

Ans: Patients with cough for more than 2 weeks and fever attended the OPD of a hospital by their own and sometimes they are referred by grass root level workers/AYUSH providers, often accompanied by those workers.

As soon as these symptomatic patients attended the hospital, if sputum microscopy facilities available they undergone AFB of sputum. Otherwise he is referred to appropriate facility.

In RNTCP, priority is given on detection of new smear positive cases for prompt treatment. But all the symptomatic cases do not attend the hospitals. Some of them attended in private practitioner, different treatment regimens are being used and with poor follow-up. Thus, increases the failure cases as well as MDR-TB cases which is very difficult to tackle.

So, passive surveillance of tuberculosis is very important now-a-days.

Q25c. Tuberculosis is an old disease but new threat-Justify. *(WBUHS, 2021)*

Ans: One Indian **Dies** of **Tuberculosis Every Minute**, No One Is Immune, Says Expert. Dr Zarir Udwadiahas over 130 PubMed indexed publications and over 7,000 citations to his credit and is co-author of "Principles of Respiratory Medicine" published (2011) by Oxford International. Earlier antitubercular drugs given 3 days in a week but from 2018 onwards, these drugs are being provided daily as per Fixed Dose Combination (FDC) and weight bands. Even though, Drug Resistance TB cases are the newer challenge in management of TB. India had an estimated 130,000 drug resistant TB cases in 2018. About 44% or around 58,347 of the estimated multidrug resistant cases were diagnosed. Of these 46,569 or around 35.8% of estimated cases received treatment. The estimated proportion of new cases with MDR/RR-TB in 2017 was 2.8%. After the COVID-19 pandemic, new case detection was hampered due to all focus was on prevention and management of COVID-19 cases. Infrastructure like microscope and X-ray and other instrument are being used for COVID-19 case management.

So, considering the fact treat of Tuberculosis case increased many fold.

Q25d. Discuss the effect of COVID-19 on tuberculosis. *(WBUHS, 2022)*

Ans: Both TB and COVID-19 are infectious diseases that primarily involve the lungs. TB spreads *via* droplet infection; SARS-CoV-2 too fans out *via* aerosol. Overcrowding promotes further propagation of both diseases. Those who are elderly, malnourished, diabetics, or who have some other chronic disease or are immunocompromised are more prone to contract these infections. Both infectious agents involve cell-mediated immunity in their pathogenesis. It is possible that one infection increases the probability of contraction of the other; possibly due to a weakening of the host immune system. The acquisition of COVID-19, as well as the use of corticosteroids for its management may also carry the risk of exogenous TB infection, or reactivation of old endogenous infection. Likewise, those with active TB or who have structural lung disease secondary to healed pulmonary Koch's disease are probably at a greater risk of developing COVID-19. The patients with latent/active TB or

post-TB sequelae are at a higher risk for severe COVID-19 and those diagnosed with SARS-Cov-2, should be followed up for development of TB.

As far as clinical manifestations are concerned, symptoms such as cough, fever, weakness, malaise and hemoptysis can be seen in both conditions. Similar presentations can pose a diagnostic challenge. Tadolini *et al* reported facilitation of TB diagnosis while investigating for SARS-CoV-19 infection in a small number of patients in their study; it was the first study conducted on a cohort of active TB or post-TB sequelae patients with COVID-19 co-infection. They called for larger studies to evaluate the impact of one agent on disease development of the other. In another study, indoor patients with active TB were screened and 20 patients were found positive out of a total of 24, indicating a possible higher susceptibility.

Q25e. Describe in details DOTS Plus. *(ABKUB, 2022; NU, 2015)*

Ans: In 1999, WHO and their partners launched DOTS-Plus. DOT-Plus was developed as a comprehensive initiative that was built upon the five elements of DOTS. However, it would take into account some specific issues such as the use of second line anti-TB drugs that was used in resource limited settings where there were significant levels of MDR TB.

This new approach of DOTS Plus needed rapid assessment of its feasibility and effectiveness under program conditions. So in 2000, the first DOTS-Plus pilot projects were launched and the Stop TB Working Group on DOTS-Plus for MDR-TB was also set up. One of the difficulties with the implementation of some of the DOTS-Plus pilot projects was the need for quality second line anti-TB drugs. These were normally very expensive and difficult to obtain. WHO and their partners made an arrangement with the pharmaceutical industry for preferential prices for the second line drugs used for the pilot projects.

However, it was considered important that these beneficial prices were only used in projects that were organized according to certain standards. So the Green Light Committee was established to review project applications. They had to decide whether the applications were sufficiently in accordance with the guidelines that had been established for the pilot projects. The drug purchasing took place through the Global Drug Facility. By July 2005, thirty six DOTS-Plus pilot projects had been established in 27 countries for the treatment of more than 10,000 MDR-TB patients.

With the ending of the piloting phase of DOTS-Plus it was believed that there was evidence that MDR-TB management was both feasible and effective in resource limited settings. With additional resources being available for MRD-TB control, there was then a rapid increase in the number of countries implementing DOTS-Plus.

Q25f. Isoniazid (INH) preventive therapy. *(MGUB, 2022)*

Ans: The dose of INH for chemophylaxis is 10 mg/kg administered daily for 6 months. TB preventive therapy should be provided to:

a. All asymptomatic contacts (under 6 years of age) of a smear positive case, after ruling out active disease and irrespective of their BCG or nutritional status.
b. Chemophylaxis is also recommended for all HIV infected children who either had a known exposure to an infectious TB case or are tuberculin skin test (TST) positive (≥5 mm induration) but have no active TB disease.
c. All TST positive children who are receiving immunosuppressive therapy (e.g., children with nephrotic syndrome, acute leukemia, etc.)
d. A child born to mother, who was diagnosed to have TB in pregnancy, should receive prophylaxis for 6 months, provided congenital TB has been ruled out followed by BCG vaccination.

POLIOMYELITIS RELATED QUESTIONS AND ANSWERS

Q26a. Write briefly on epidemiology of poliomyelitis. *(SAMU, 2010; NU, 2010; RGUHS, 2024)*

Ans: Epidemiology deals with distribution and determinants of health or health-related states and application of the knowledge gained from the study of distribution and determinants to reduce the burden of health

problem. The residual effects of polio are due to destruction of the anterior horn cells of the spinal cord and the brainstem. This causes lower motor neuron type of lesion with flaccid paralysis and normal sensation.

Epidemiological determinants:

- **Agent factors:** The polio virus is an ultra microscopic virus 27 nm in diameter. This can be grown in tissue culture and three types were isolated in **1951.** Antigenically these 3 serotypes of poliovirus, namely **Brunhilde (Type 1), Lansing (Type 2)** and **Leon (Type 3).** Most outbreak of paralytic polio due to type I. About 80-90% of polio cases due to type 1. Type III causes paralysis less frequently and type II causes rarely. It can survive for long periods in external environment. In cold environment, in water for 4 months, faces for 6 months.
- **Reservoir of infection:** Man is the only known reservoir of infection. No animal source has been demonstrated. Mild and subclinical infections play a dominant role in the spread of infection. They constitute the submerged portion of ice-berg. It is estimated that for every clinical case, there may be 1,000 subclinical cases in children and 75 in adults.
- **Infectious materials:** The virus is found in feces and oropharyngeal secretions of an infected person.
- **Period of communicability:** The cases are infected 7–10 days before and after the onset of symptoms. In feces, the virus excreted commonly for 2–3 weeks, sometimes, as long as 3–4 months.

Host factors:

- **Age:** In India, polio is a disease of infancy and childhood. The most vulnerable age between 6 months to 3 years.
- **Gender:** Male : Female ratio is 3:1.
- **Risk factors:** Several provocative and risk factors precipitated the attack of paralytic Polio like fatigue, trauma, intramuscular injections, operative procedure like tonsillectomy undertaken during polio epidemic and administration of alum-containing DTP.
- **Immunity:** The maternal antibodies gradually disappear during the first 6 months of life. Immunity following infection is fairly solid although re-infection can occur from other type of virus. Type 2 virus is already eradicated. **Environmental factor:** Polio is more likely to occur in rainy season. Earlier 60% of cases are recorded in June to September. The environmental sources are contaminated water, food and flies. Over-crowding and poor sanitation provide opportunities for exposure to infection.

Mode of transmission:

- **Fecal-oral route:** Directly through contaminated fingers, indirectly through contaminated water, food and flies.
- **Droplet infection:** Occur in acute phage of disease, close personal contact with an infected person facilitates droplet infection.

Incubation period: Usually 7–14 days.

All the information for practical implementation is required to reduce the incidence of poliomyelitis.

Q27. Discuss polio eradication in the light of epidemiological factors influencing poliomyelitis. *(BNMUB, 2018)*

Ans: Construct the answer from previous question as epidemiological factors described.

Q28. What do you mean by acute flaccid paralysis (AFP)? There are few cases of AFP admitted in a sentinel hospital, as a health officer what will you do? Discuss various strategies for eradication of poliomyelitis including environmental surveillance of AFP. *(BNMUB, 2002, 2008; NU, 2013, 2016; WBUHS, 2007, 2019; TRIU, 2014, 2023; RGUHS, 2014; SAMU, 2010; TDMGRMU, 2011; DU, 2012; SSUHSA, 2008)*

Ans: AFP (Acute Flaccid Paralysis) is now defined as **"any child aged less than 15 years of age who has sudden onset of paralysis or paralytic illness in a person of any age when polio is suspected."**

Besides poliomyelitis, AFP cases also include GB syndrome, transverse myelitis, traumatic neuritis.

Steps of AFP surveillance: Immediate reporting of all cases of AFP below 15 years of age by healthcare provider to district MCH officer/surveillance medical officer (SMO).

All reported cases are to be investigated within 48 hours of reporting in order to confirm clinical diagnosis and obtain laboratory specimen of AFP cases.

For all reported cases, 2 stool samples (each sample consists of thumb size 8–10 gram of stool) are to be collected in sterile screw capped containers 24–48 hours apart before outbreak containment measures. Stool samples collected within 2 weeks of onset of paralysis have a higher virus isolation rate. The stool samples are so collected, sent to designated laboratory for virus isolation. Cold chain is maintained during transportation of stool samples and a laboratory request form should accompany stool samples.

All the AFP cases are followed up to 60 days to look for residual paralysis.

Outbreak response immunization: It should cover the entire village in rural areas and municipal word in the urban areas, where the AFP case has occurred. All the under-five children in that area are vaccinated with OPV irrespective of previous immunization status. Even a single case is treated as an outbreak and preventive measures are initiated usually 48 hours of notification of case. Containment measures are not recommended if the period after onset of paralysis is more than 14 days.

After detection of wild polio virus regardless of source, should be considered a public health emergency and responded to with urgent multiple high quality mop-up campaigns.

Mop-up should target both the area of detection of the virus in a case or in the environment. Each mop-up should cover about 2–5 million children. The first round should be conducted within 2 weeks following confirmation of a case.

In nonhigh risk areas mop-ups should consist of a minimum of 3 quality rounds with minimum interval of 2 weeks but within 4 weeks.

In high-risk areas, SNID may constitute more than 3 rounds that mean one additional rounds in affected area.

(RGUHS, 2024)

Strategies for eradication of poliomyelitis

- Routine immunization
- Intensified pulse polio immunization (IPPI)
- Enhanced surveillance of acute flaccid paralysis (AFP)
- Mopping up

Routine immunization: This is an ongoing activity. All the children should receive OPV vaccine at birth **(OPV0 for sensitization of gut),** OPV 1, 2, 3 at 6, 10 and 14 weeks respectively and OPV booster at 16–24 months. IPV should be given at 6 and 14 weeks, intradermal route at right upper arm, dose 0.1 mL. Coverage should be monitored at lowest possible level through routine reporting system. Birth cohort should be monitored on monthly basis. When coverage level with three doses of OPV are less than 80%, special campaigns should be conducted to boost the coverage level.

Intensified Pulse Polio Immunization (IPPI): It is carried out through national and sub-national immunization day. **The term "pulse" has been used to describe sudden, simultaneous, mass administration of two drops of OPV on a single day to all children of 0–5 years of age, regardless of previous immunization.** Mass campaign of IPPI probably acts by flooding the environment with vaccine virus, so that probability of encountering the virus is low or rapidly increasing population immunity. Sero-conversion is also higher. There is no contraindication to IPPI. Even very sick children are immunized. Particular attention is paid to urban slums and other clusters of low immunization coverage. Nowadays, it is called as Intensified Pulse Polio Immunization **(IPPI). The term intensified means first day immunization at vaccination site (Booth) followed by 3 days of home visit for vaccination of missed children, if any.**

Enhanced surveillance of AFP through mopping up: Mopping up immunization is an end strategy of polio eradication. It is used when polio virus transmission is no longer dispersed but is reduced to a few foci. These are then targeted for high quality house to house immunization. The strategy is exclusive house

to house immunization with meticulous micro-planning and intense supervision ensuring in that area compulsorily reached.

Environmental surveillance: Wild polio virus can be detected in different environmental samples sewage. These samples can be tested in the laboratory for presence of wild polio virus. If WPV is found the sample, this indicates active transmission of virus in the community.

Q29. Illustrate how the levels of prevention and modes of intervention can be applied to poliomyelitis. (WBUHS 2010)

Ans: Different levels of prevention and modes of interventions:

Levels of prevention	*Mode of intervention*
Primary prevention	Health promotion Specific protection
Secondary prevention	Early diagnosis and treatment
Tertiary prevention	Disability limitation and rehabilitation

Levels of prevention in relation to poliomyelitis primary prevention:

- Health promotion trough health education, environmental modification, nutritional intervention and change of life style and behavior.
  Health education: Intensive IEC activities are conducted for awareness generation and particularly reduction of stigma and discrimination against polio affected persons. As poliomyelitis is a water-borne disease, consumption of safe water is very important. These activities are carried through—mass media, outdoor media, rural media and group approach, etc.
- **Specific protection:** Administration of OPV in the neonates in case institutional deliveries, routine immunization as well as all children up to 5 years of age during IPPI (Intensified Pulse Polio Program).

Secondary prevention:

Early diagnosis and treatment: Diagnosis consists of history and thorough physical examination and isolation of wild polio virus from the stool confirm the diagnosis of paralytic poliomyelitis.
History of asymmetrical flaccid paralysis is indicative of poliomyelitis.

Case management: As there is no treatment, polio cases require general supportive care and skill management as follows: Isolation in isolation word because it is infectious. Concurrent disinfection of saliva and excreta in 10% cresol. Absolute bed rest in the acute phase. There should not be any stress in affected muscles. Frequent change of posture through nursing care. Symptomatic relief with paracetamol to relieve pain and fever. Antibiotic to prevent secondary infection. Massage and injection in the acute phase is absolutely contraindicated. Maintenance of fluid and electrolyte balance done orally but not by infusion.

Supportive treatment with splints is provided to limbs to prevent deformity resulting from the action of antagonistic muscles.

Tertiary prevention: It consists of **disability limitation and rehabilitation**.

Physiotherapy is not recommended in early stage and can be done after 6 weeks. It helps in weakened muscles to regain strength also prevent contractures and deformities. Child may put on metal calipers. Other types of rehabilitation are—social, vocational and psychological rehabilitation.

SHORT NOTES AND RELEVANT QUESTIONS ON POLIOMYELITIS

Q30a. Immunization for travelers.

Ans: Immunization of travelers to and from countries where polio transmission is going on, is aimed at risk mitigation. **The MoHFW has issued few guidelines:**

- Requirement of a dose of OPV for all outgoing and incoming travelers of the following countries mentioned below.
- Indian High Commission in these countries will issue visa only after ascertaining that the traveler has received **a dose of OPV, 4 weeks prior to arrival in India**. The certificate of incoming travelers is further checked at immigration desk.
- For outgoing travelers, vaccination should preferably be done 4 weeks prior to leaving the country. For this, High Commission/Embassies of the endemic countries in India have been directed by Ministry of External Affairs to issue visa only after ensuring the receipt of a valid certificate of OPV vaccination. Any remaining traveler will be given a dose of OPV just before departure at OPV booth at the international airport.
- Notification in this regard has been issued by the immunization department (GOI), as it is a legal mechanism for enforcing this strategy of administration of OPV at points of entry.
- GOI has already issued guidelines, effective from March 1, 2014, by which OPV has been made mandatory for travelers between India and **eight other countries namely, Afghanistan, Pakistan, Nigeria, Ethiopia, Kenya, Somalia, Syria, and Cameroon**.

Q30b. What is provocative poliomyelitis? *(RGUHS, 2002)*

Ans: Provocative poliomyelitis is a resulting disease and paralysis following provocation of latent poliovirus due to certain factors:

a. Painful intramuscular injections
b. Fatigue, trauma, exercise
c. Head and neck region surgeries

Mechanism:

a. **Painful intramuscular injections:** Injection like DPT especially during the stage of viremia, increases vascularity of that part of spinal cord, subserving the site of infections associated with irritation of injection, predisposing the virus to affect the spinal cord.
b. **Fatigue, trauma, exercise:** These factors during the stage of viremia predispose the early onset of disease.
c. **Head and neck region surgeries:** Procedures like tonsillectomy, adenoidectomy, tooth extraction during epidemics, tend to prevent or reduce the formation of IgA, local antibody in the pharynx thereby allowing the virus to have an easy access to the CNS, resulting in bulbar rather than spinal form of paralysis.

Significance: Provocative factors are responsible for occurrence of polio during immunization drive, thus resulting loss of faith of people engaged in pulse polio immunization. ENT surgeon and dental surgeons must bear the risk of poliomyelitis while operating during polio epidemics.

YELLOW FEVER

Q31a. Measures to prevent entry of yellow fever into India. *(RGUHS, 2008; MGUB, 2024)*

Ans: The yellow fever virus can gain entry into India through infected travelers (clinical and subclinical cases) and infected mosquitoes. To prevent entry of yellow fever virus, the Government of India adheres to International Health Regulations of WHO, which are implemented through stringent aerial and maritime traffic regulations.

Travelers: All travelers including infants exposed to the risk of yellow fever or passing through endemic zones of yellow fever must possess a valid international certificate of vaccination (validity 10 days – Lifelong) against yellow fever before they are allowed to enter yellow fever receptive areas. If the travelers do not possess the certificate then he is placed under quarantine in a mosquito proof ward for 6 days for observation from the date of leaving an infected area. If the traveler possesses the certificate and arrives before the certificate becomes valid, he/she is isolated till the certificate becomes valid.

Mosquitoes:

a. The aircrafts and ships arriving from endemic zones are subjected disinfection with aerosol spraying of prescribed insecticides on arrival for destruction of insect vectors.

b. The ships are moored about 400 meters from seaport and disinfected.
c. Airports and seaports are kept free from the breeding of insect vectors over an area extending at least 400 meter around their perimeter.
d. ***Ades aegypti*** index is kept below 1.

Significance: Strict implementation of aerial and maritime traffic regulations is very important to prevent yellow fever in India as it is a receptive area for yellow fever.

Q31b. India is yellow fever receptive area—explain. *(WBUHS, 2009, 2018; SAMU, 2022)*

Ans: Yellow fever is a zoonotic disease caused by an arbovirus. However, India is a yellow fever receptive area i.e. an area in which yellow fever does not exist where conditions would permit its development if introduced. The reasons are as follows:
a. Population is unvaccinated and susceptible
b. Vectors (*Aedes aegypti)* are found in abundance
c. Monkey species found in India (*Macacus rhesus* and *Macacus sinicus*) are susceptible
d. Climatic conditions are favorable in most parts of India for its transmission.

But still the disease does not exist because the missing link in chain of transmission is the yellow fever virus which is not present in India.

The virus of yellow fever could get imported in India in two ways.

Through infected traveler (clinical and subclinical cases), through infected mosquitoes.

So India is yellow fever receptive area and once affected, it may cause **havoc.**

Q31c. *Aedes aegypti* index. *(BNMUB, 2017; RGUHS, 2013; TDMGRMU, 2016; VNSGUS, 2023)*

Ans: WHO uses an index for surveillance of *Aedes* mosquito is known as *Aedes aegypti* index. It is defined as **"the percentage of houses and their premises, in a limited well-defined area, showing actual breeding of Aedes aegypti larvae"**. This index should not be more than 1% in towns and sea ports in endemic areas to ensure freedom from yellow fever.

SHORT NOTES AND RELEVANT QUESTIONS

Q32. SAFE strategy for trachoma. *(ABKUB, 2016, 2021)*

Ans: SAFE strategy for trachoma: The World Health Organization lead an international alliance of interested parties to work for the global elimination of trachoma, the Alliance for Global Elimination of Trachoma by the year 2020 *(GET 2020).*

Trachoma is an infectious disease responsible, at present, for approximately 3% of the world's blindness. There are about 8 million people irreversibly visually impaired by trachoma; an estimated 84 million cases of active disease in need of treatment, if blindness is to be prevented.

SAFE strategy: International efforts to eliminate trachoma as a blinding disease will be based on the WHO-developed strategy—a combination of interventions known by the **acronym "SAFE"** which stands for **surgery for trichiasis (inturned eyelashes), antibiotics, facial cleanliness and environmental improvement.** These interventions will be community-targeted and will seek community involvement through the primary healthcare approach.

Components:

S - Lid surgery for those at immediate risk of blindness
A- Antibiotic to treat cases and reduce infection in the community (azithromycin is the drug of choice)
F- Facial cleanliness and promotion of hygiene to reduce the transmission
E- Environmental improvements such as provision of water and household sanitation

Q33. Inappropriate and inadequate use of antibiotics leads to antimicrobial resistance. *(WBUHS, 2018)*

Ans: Antibiotic resistance is a global crisis driven by appropriate and inappropriate antibiotic use to treat human illness and promote animal growth. The antimicrobial resistance epidemic continues to spread due to the triple threat of unfettered access, minimal product regulation and oversight of antibiotic prescription, and lack of clinical diagnostic tools to support antibiotic de-escalation in low-resource settings. It happens when microorganisms (such as bacteria, fungi, viruses, and parasites) change when they are exposed to antimicrobial drugs such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics.

The emergence and spread of antimicrobial resistance: Antimicrobial resistance occurs naturally over time, usually through genetic changes. However, the misuse and overuse of antimicrobials is accelerating this process. In many places, antibiotics are overused and misused in people and animals, and often given without professional oversight.

Need for coordinated action: Antimicrobial resistance is a complex problem that affects all of society and is driven by many interconnected factors. Single, isolated interventions have limited impact. Coordinated action is required to minimize the emergence and spread of antimicrobial resistance. All countries need national action plans on AMR.

CMB.4: Describe the principles and enumerate the measures to control a disease epidemic.

Ans: Refer Chapter 7, Q.37.

CMB.2: Describe and discuss the epidemiological and control measures including the use of essential laboratory tests at the primary care level for noncommunicable diseases (diabetes, hypertension, stroke, CHD, rheumatic heart disease, obesity, cancer, blindness, accidents and injuries, etc.) and their national health programs.

Essential laboratory tests at the primary care level for noncommunicable diseases:

Health facility	*Package of services*
Sub-center	• Health promotion for behavior change and counseling • Population based/opportunistic screening of common NCDs including cancers like breast, cervix and oral • Awareness generation of early warning signals of common cancers and other risk factors of NCDs • Referral of suspected cases to PHC/CHC/nearest health facility • Follow-up of patient created in PHC
PHC	• Health promotion for behavior change and counseling • Population based/opportunistic screening of diabetes, hypertension and three common cancers like oral, breast and cervical by VIA • Identification of early warning signals of common cancers • Early diagnosis through clinical and laboratory investigation • Early treatment of common NCDs including hypertension and diabetes • Referral of suspected cases to CHC/DH and also referral of complicated cases of DM/HTN to CHC/DH
CHC	• Daily diagnostic facilities like blood glucose, total cholesterol, lipid profile, blood urea, creatinine, X-ray, ECG, USG (to be outsourced, if not available), opportunistic screening of common cancers like oral, breast and cervix • Management of common NCDs • Referral of complicated cases to DH/higher healthcare facility

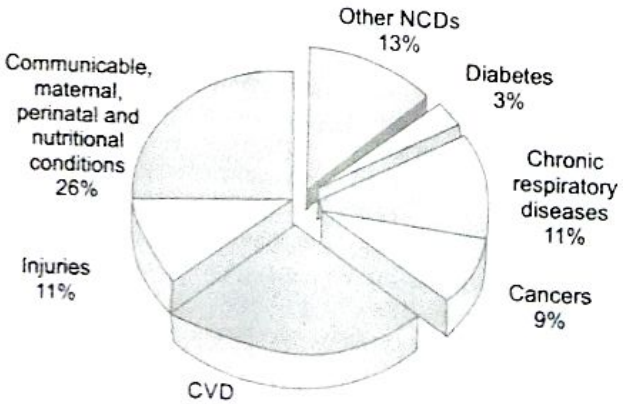
Q34. What are the major "risk factors" responsible for sharing noncommunicable disease among adults? *(WBUHS, 2022; BNMUB, 2009; SAMU, 2011; SSUHSA, 2015, 2022, 2023)*

Ans: A set of risk factors are responsible for major share of adult noncommunicable disease morbidity and premature mortality. These are given below:

Risk factors	Discussion
Tobacco	Tobacco smoking is an independent risk factors for various types of noncommunicable diseases like cardiovascular diseases, COPD, cancer, peptic ulcer, etc. The highest incidence of smoking among men is in lower middle-income countries, but among the total population, smoking prevalence is highest among upper middle income countries
Harmful use of alcohol	This is an important risk factor for cardiovascular disease, cancer, cirrhosis of liver, etc. The occurrence of various noncommunicable diseases is increasing with the increase of per capita alcohol consumption
Insufficient physical activity	This increases the risk for cardiovascular disease including high blood pressure, diabetes, breast and colon cancer, depression. Insufficient physical activity is highest in high income countries
Unhealthy diet	Adequate consumption of fruits and vegetables reduces the risk of cardiovascular diseases, stomach cancer and colorectal cancer. Most populations consume much higher level of salt than recommended by WHO for disease prevention. High salt consumption is an important determinant of high blood pressure and cardiovascular risk. High consumption of saturated fat and trans-fatty acid is linked to heart disease. Unhealthy diet is rising quickly in lower-resource setting
Raised blood pressure	It is a major risk factor for various cardiovascular diseases. The prevalence of raised blood pressure is similar across all income groups
Overweight and obesity	Risk of heart disease, stroke and diabetes increase steadily with increasing body mass index and increased waist-hip ratio. Raised BMI also increases the risk of certain cancers
Raised cholesterol	It is estimated to cause 2.6 million deaths annually. It increases the risk of heart disease and stroke. Raised cholesterol is highest in high income countries
Stress	Due to stress at workplace and family, increased complications in life, various types of non-communicable diseases are increasing

Q35. Enumerate noncommunicable disease of public health importance. *(DU, 2013, 2016; KIMS, 2019)*

Ans: India shares more than two-thirds of total deaths due to noncommunicable diseases (NCDs) in SEAR of WHO. Four types of NCDs had the largest contributions to morbidity and mortality, they are cardiovascular diseases (27%), cancer (9%), chronic respiratory diseases (11%) and diabetes (3%). Again, four behavioral risk factors are responsible for significant proportion of these diseases like tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol. Major metabolic risk factors are obesity, raised blood pressure, raised blood glucose and raised total cholesterol levels. The probability of dying between ages 30 and 70 years from four major NCDs is 23% of them 27% in men and 20 % in women which means that a 30 years old individual has one-fourth chance of dying from these diseases before the age of 70 years. **Figure 8.1** shows the proportional mortality in India.



Proportional mortality in India (% of total deaths, all ages) 2016
Total deaths 9,569,000

Fig. 8.1: Proportional mortality of NCDs in India.

DIABETES RELATED QUESTIONS AND ANSWERS

Q.36. Epidemiology of diabetes *(RUJH, 2010)*/**Rising trend in occurrence of diabetes has been observed throughout India.** *(WBUHS, 2023; BNMUB, 2020; RUJH, 2023; TRIU, 2024)*

Ans: Diabetes mellitus is the most common metabolic disorder in the world. According to International Diabetic Federation (IDF), 415 million people in the world live with diabetes as on 2015. In most of the countries, the number is increasing.

The development in last 150 years have made a dramatic difference to the life of a person with diabetes. Now, Type 1 diabetes is no longer invariably fatal. Patients with type 2 diabetes can now expect to live longer and more comfortably than they did in the past. Most people with diabetes have type 2 diabetes. Type 1 diabetes contributes around 5% of the total diabetic subjects. The prevalence of type 1 diabetes is highest in northern Europe and low in Africa and Asia.

According to IDF Diabetes atlas 2015, the number of people with diabetes in the five top countries are, China 109.6 million followed by India 69.2, USA 29.3, Brazil 14.3 and Russia Federation 12.1 million respectively.

Prevalence rate of diabetes have been found to be high in certain isolated populations like the Pima Indians of Arizona and Pacific Island populations. The highest prevalence of diabetes as per IDF, 2015 are Tokelau 30% followed by Nauru 24.1, Mauritius 22.3, Cook islands 21.5 and Marshal Islands 21.3% respectively.

India the prevalence rate of diabetes have increased dramatically since 1st national survey was undertaken in 1971, the urban prevalence was 2.3% and rural prevalence was 2.1%. But 2014 study showed that prevalence in urban between 15–20% and about half in rural areas (Unnikrishnan et al. Nat Rev Endocrinol, 2016).

The reasons for the explosive increase in the prevalence of diabetes in India have been the subject of much study. It is unlikely that the genetic make up of the population has changed so dramatically in the past 30 years as to count for the alarming increase in prevalence of diabetes but more likely, increasing prosperity and urbanization have led to wholesale changes in lifestyle which cause diabetes to manifest in individuals who already have a genetic predisposition to the disease **(Fig. 8.2)**.

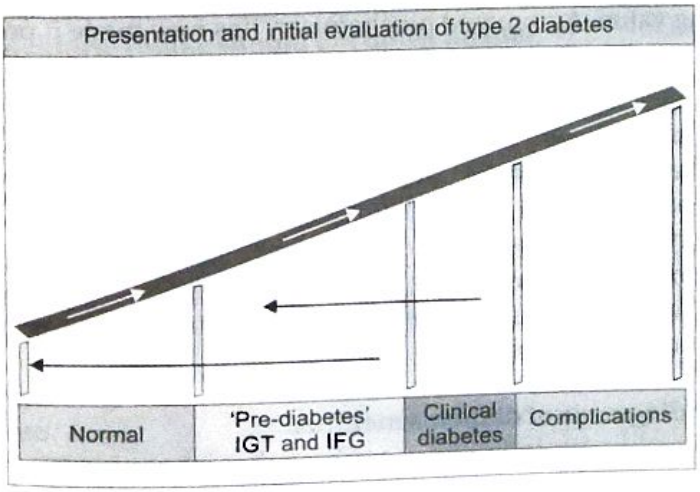


Fig. 8.2: Natural history of diabetes.

Q.37. Classify diabetes mellitus as adopted by WHO (the major clinical types of diabetes mellitus), discuss approach to diabetic screening and WHO recommendations for diagnostic criteria for diabetes and intermediate hypoglycemia. *(WBUHS, 2020; BNMUB, 2017; ABKUB, 2018; KIMS, 2017)*

Ans: Classification of diabetes adopted by WHO:

1. Type 1 diabetes (beta cell destruction, usually leading to absolute insulin deficiency)/Insulin dependent diabetes mellitus
2. Type 2 diabetes (may range from predominantly insulin resistance with relative insulin deficiency)/ noninsulin dependent diabetes mellitus
3. Malnutrition related diabetes mellitus (MRDM)
4. Other types (secondary to pancreatic [fibrocalculous pancreatic diabetes (FCPD), prevalent certain part of India, particularly in Kerala and Tamil Nadu], hormonal, drug-induced, genetic, etc).
5. Impaired glucose tolerance (IGT)
6. Gestational diabetes mellitus (GDM)

Previously, the commonest approach to diabetes screening was a preliminary, semi-quantitative test for urine sample, followed by oral glucose tolerance test those found to be glycosuria. The underlying assumption is that the early detection and effective control of hyperglycemia in asymptomatic diabetics reduces morbidity.

Urine examination: Urine test for glucose, 2 hours after meal, is commonly used in medical practice for detecting cases of diabetes. All case of glycosuria are considered diabetic unless is proved by standard oral glucose tolerance test. Most studies confirmed that although glucose is found in urine in most severe cases of diabetes, sometimes it is absent in milder forms of the disease and such cases likely to be missed by urine test. The sensitivity of test (i.e., proportion of people with disease who have a positive test) varies between 10-15%. The lack of sensitivity means that many diabetics would have been missed if only test done. That is the test yields too many "false negatives". Again glycosuria may be found in perfectly normal people, this gives rise to "false positives". As the specificity of the test is over 90%, the yield of false-positives is not very high. For this reasons, urine test is not considered an appropriate tool for case finding of epidemiological surveys of the population.

Blood glucose testing: Because of the inadequacies of urine examination, "standard oral glucose test" remain the important tools for diagnosis of diabetes. In mass screening program, the blood test is done for fasting, postprandial or random glucose measurements. Random blood glucose examination is considered unsatisfactory in epidemiological use, it can give a crude estimate of frequency of diabetes in the population. The fasting glucose alone is less reliable since true fasting cannot be assured and spurious diagnosis of diabetes may more readily occur. So, epidemiological purposes, the 2-hour value after 75 gram oral glucose may either alone or with the fasting value. Automated biochemistry has now made it possible to screen thousands of samples for glucose estimation. So, WHO criteria is used for diagnosis of diabetes.

Target groups: Screening of diabetes for whole population is not possible. So screening is done for high-risk groups:

a. Age group 40 and above
b. Family history of diabetes
c. Obese
d. Women who have baby delivered weighing more than 4.5 kg
e. Excess weight gain during pregnancy
f. Patients with premature atherosclerosis

Q38. Diagnostic criteria for diagnosis of diabetes mellitus. *(WBUHS, 2021)*

According to American Diabetic Association (ADA), 2017.

Ans: Diabetes can be diagnosed based on any one of the following:

- **Symptoms of diabetes + casual plasma glucose concentration ≥200 mg/dL**
  (Casual—any time of the day without regard to time since last meal)
- **Fasting plasma glucose ≥126 mg/dL**
  (Fasting—no calorie intake for at least 8 hours)

- **2 hours plasma glucose during OGT ≥200 mg/dL**
  (OGTT—2 hours after 75 g of glucose for adult)
- **HbA1c ≥6.5%**

Q59. Enumerate the levels of prevention and modes of intervention in the context of diabetes.
(WBUHS, 2016, 2017, 2022; MGUB, 2023, 2024; KIMS, 2019; GOAU, 2021; RUJH, 2023; SSUHSA, 2024)

Ans: Levels of prevention and intervention in relation to diabetes mellitus:

Levels of prevention	*Mode of intervention*
Primary prevention	Health promotion Specific protection
Secondary prevention	Early diagnosis and treatment
Tertiary prevention	Disability limitation Rehabilitation

A. **Primary prevention of diabetes mellitus:** The primary prevention of type 1 diabetes is limited on the present knowledge available and not appropriate also. Primordial prevention is an important aspect of the primary prevention of type 2 diabetes. It is prevention of population groups from risk factors which have not yet appeared. Obesity in childhood, when lifestyles are formed (eating habit, smoking and physical exercise) can be prevented in the community.

Health promotion:

a. *Health education:* Patients education in case diabetic patient is very important as it is a life-long disease, no known cure of it, patient has to learn to live with the disease, so patient is the active partner in its management.

b. *Nutritional interventions:* The calorie requirements of a person with diabetes depend on physical activity and nutritional status.

Ideal body weight (IBW) is calculated by the formula:

$$\textbf{IBW} = (\textbf{Height} - 100) \times 0.9$$

Individual with more than 120% of ideal weight are considered overweight and those less than 90% of ideal weight are considered underweight.

Patients calorie intake should be altered gradually, not more than 500 kcal per day. If the individual is sedentary, the calorie intake should cut down further.

- *Carbohydrate* is the main source of energy for Indians and having greatest impact on blood glucose levels. So diabetic patients are advised to avoid simple carbohydrates like sugar cane, honey, jiggery, sweets and restrict maida-based products. The main source of carbohydrates should be cereals, whole pulses, salads and soyabeans. Roots and tubers should be used sparingly
- Total dietary fiber intake should be 15 g/1,000 kcal
- *Protein intake* should be 1 g/kg/day. In case of diabetic nephropathy, protein restricted to 0.8 g/kg/day
- *Fats* should contribute no more than 30% of total energy intake per day. Fat should be in a proportion of SFA, PUFA and MUFA
- *Intake of salt* up to 5 g/day
- *Functional foods:*
  - ◊ Fenugreek (Methi seeds) reduce glucose and cholesterol level when consumed at a dose of 15–90 g per day.
  - ◊ Oats contain β glucan, a cholesterol lowering fiber, soyabeans also reduce cholesterol levels when taken at a dose of 25 gram per day. Flaxseed reduces LDL cholesterol.

Following foods can be eaten in unlimited amounts:

- Vegetables—cabbage, cauliflower, leafy vegetables, tomatoes
- Clear soups, tomato juice, thin butter milk and lime juice without sugar

- Sweeteners—saccharin and aspartame should be used
- Alcohol—can increase susceptibility to hypoglycemia. Daily alcohol consumption limited to 60 mL/day for women and 120 mL/day for men
- The diet should be integrated with other community-based program for prevention of non-communicable diseases like coronary heart disease
- For nonvegetarian, more fish and chicken can de allowed, they should not be fried
- Red meat should be consumed in small quantities and less frequently

c. *Change of life styles and behavior changes:* *(BNMUB, 2022)*
At least 150 min/week of moderate activity spread over at least 5 days/week with not more than 2 consecutive days without exercise.
Smoking and the use of tobacco in any form should be discouraged.
Life style management to prevent diabetes mellitus. *(WBUHS, 2022)*
It is mainly through primary prevention
Nutritional intervention and change of life style and behavior

d. *Environmental modifications:* Housing should be helpful.
Specific protection: Administration of ***Haemophilus influenzae*, hepatitis B and pneumococcal conjugate vaccines in all diabetic patients are mandatory.**
Along with this foot care is very important it is documented that lower limb amputation are at least 11 times more common in diabetic than in nondiabetic individuals in developed countries.

B. Secondary prevention of diabetes:

Early diagnosis and treatment: Diagnosis consists of history and thorough physical examination.

History: Typical presentation

- In 4th or 5th decade of life
- Positive family history
- Overweight/obese
- **Markers of insulin resistance (acanthosis nigricans, skin tags)**
- **Presence of polyurea, polydipsia, polyphagia, polyneuropathy and weight loss, etc.**

Physical examination:

- Anthropometric measurements—height, weight, BMI, waist circumference
- Blood pressure—both hands including postural variation
- Thyroid examination
- Skin examination for markers of insulin resistance (acanthosis nigricans, skin tags)
- Examination of abdomen—insulin site inspection
- Dental examination
- Comprehensive foot examination
- Dilated retinal examination

The main approaches of management are control of hyperglycemia.

The following drugs are used:

- Metformin
- Sulfonylureas
- Pioglitazone
- Repaglinide/Nateglinide
- Voglibose
- Vildagliptin
- Canagliflozin
- Administration of insulin
- BP control
- Correction of hyperlipidemia

C. **Tertiary prevention of diabetes:**
- It consists of disability limitation and rehabilitation.
- Limiting physical disability and rehabilitation measures in those who have already developed diabetic complications.
- Early approach—education, detection of risk factors and drug therapy
- Intermediate approach—extensive measures to correct risk factors
- Late approach—surgery

Q.38 What primary preventive measures you will take for those having family history of diabetes? *(KIMS, 2014)*

Ans: T2DM usually having a positive history of diabetes along with other symptoms.

Differences between monogenic diabetes and early onset type 2 diabetes

Monogenic diabetes	Early onset type 2 diabetes
Nonobese	Obese/over weight
Acanthosis nigricans are uncommon	Acanthosis nigricans and skin tags are present
Three generation transmission with only one parent affected	Both parents could be affected
Only insulin secretary defect	Defect in insulin secretion and insulin resistance
Seen in all populations	Usually, population with high prevalence of T2BM
Responds better with sulfonylureas	Respond initially with metformin but later stages Insulin is required

You are referred to Q.39 for primary preventive measures.

Q.41 Discuss multi-causation in diabetes/discuss briefly different epidemiological determinants/risk factors of diabetes. *(WBUHS, 2008, 2020, 2021, 2023; ABKUB, 2005; BNMUB, 2017, 2020; RGUHS, 2010, 2012; KIMS, 2017; DU, 2013, 2016; RUJH, 2012; SDVPG, 2023; GNSUB, 2023; GOAU, 2023)*

Ans: Diabetes is a heterogeneous group of diseases, characterized by a state of chronic hyperglycemia resulting from diversity of etiologies which include environmental and genetic factors.

Epidemiology (multiple causal factors)

A. **Agent factors:** Insulin deficiency, either absolute in IDDM and partial in NIDDM due to:
- *Pancreatic disorders:* Congenital, neoplastic, inflammatory, traumatic and surgical
- *Defects in formation of insulin:* Synthesis of abnormal, biologically less active insulin
- *Destruction of beta cells:* Viral infections, chemical agents
- *Decreased insulin sensitivity:* Due to decreased numbers of adipocyte and monocyte insulin receptors
- *Genetic defects:* Mutation of insulin gene
- Autoimmunity

B. **Host factors:**
- *Age:*
  - Diabetes occurs at any age but prevalence rises in advancement of age
  - Type 1 DM is common in younger age groups below 30 years whereas type 2 in middle aged and elderly person. If diagnosis at younger age, worse the prognosis.
- *Gender:* Male and female ratio almost equal.
- *Genetic factors:* NIDDM is entirely genetic origin (90%) but IDDM is not totally genetic in origin (50%)
- *Genetic markers:*
  - IDDM is associated with HLA-B8 and B15 and more powerfully with HLA-DR3 and DR4.
  - NIDDM is not HLA associated.
- *Immune mechanism:* Certain individuals exhibit both cell mediated and humoral immunity against islet cells of pancreas.

- *Obesity:* Obesity, particularly central obesity is a major risk factor for NIDDM and it is has no role in IDDM pathogenesis.
- *Maternal diabetes:*
  - Children born to mothers with gestational diabetes are at higher risk of developing type 2 diabetes at early age.
  - Children of diabetic mothers are at three times more risk of developing diabetes.

C. **Environmental factors:**

- *Sedentary lifestyle:* An important risk factor for NIDDM by altering interaction between insulin and its receptors.
- *Diet:*
  - Intake of high saturated fat is associated with higher risk of impaired glucose tolerance, higher fasting glucose and insulin levels.
  - Diet rich in unsaturated fatty acids reduces risk of type 2 diabetes by lowering fasting and 2 hours glucose levels.
- *Dietary fiber:* High intake of dietary fibers (through nonstarch polysaccharides) reduces blood glucose and insulin levels in people with type 2 diabetes.
- *Malnutrition:* Malnutrition in early infancy and childhood may result in partial failure of beta cells functions.
- *Alcohol:* Excess intake of alcohol increases risk of diabetes by damaging liver and pancreas also increase obesity.
- *Viral infections:* Viral infections like rubella, mumps, human coxsackie virus may induce immunogenic reaction in susceptible individuals resulting beta cell destruction.
- *Chemical agents:* Chemical agents like streptozotocin, alloxan, etc., are toxic to beta cells
- *Stress and stain:* Stress situations like surgery, trauma, etc., may predispose to diabetes.
- *Other factors:* Diabetes is also linked to other factors like occupation, marital status, religion, economic status, education and change of life style.

Q.12. Describe measures for prevention and control of type II diabetes mellitus.
(WBUHS, 2023; BNMUB, 2017, 2020; KIMS, 2017; DU, 2013, 2016; RGUHS, 2012; SDVPG, 2023)

Ans: Plan for control of diabetes in district:

A. **Initial assessment**

- To assess the magnitude, geographical distribution and causes of diabetes in the district by prevalence surveys.
- From the background knowledge, setting up the priorities and subsequently intervention strategies are developed.

B. **Methods of prevention**

- *Primary prevention:*
  - *Population strategy:*
    - ◊ Efforts are directed to children and adults through mass education
    - ◊ Improvement of nutritional habits like avoiding sweets, fatty foods, alcohol
    - ◊ Regular intake of protein and dietary fibers
    - ◊ Maintenance of body weight by doing moderate exercise
  - *High risk strategy:*
    - ◊ Efforts are directed towards high-risk groups
    - ◊ Age over 40 years
    - ◊ Obesity
    - ◊ Family history of diabetes
    - ◊ Sedentary workers with lack of exercise
    - ◊ More than 3 kg body weight gain in one months of pregnancy

- ◊ Complaints of polyurea, polyphagia, polydipsia, sudden loss of weight, repeated infections, non-healing ulcers, etc.
- ◊ During antenatal check up
- ◊ History of babies weighing more than 4.5 kg

Those group of people mentioned above should be screened for diabetes by urine and blood examination and corrective measures should be taken accordingly:

- ◊ Correction in obesity
- ◊ Change of lifestyles
- ◊ Avoid smoking and alcohol
- ◊ Regular exercise
- ◊ Maintenance of normal body weight
- ◊ Regular checking of BP
- ◊ Regular checking of blood cholesterol level
- ◊ Avoidance of oral contraceptives and steroids

- *Secondary prevention:*
  - Early diagnosis and treatment
  - Treatment modalities are:
    - ◊ Diet alone: Small balance meals with plenty of raw vegetables and less cereal more frequently and no fast and feast
    - ◊ Diet and antidiabetogenic drugs: Restriction of diet along with antidiabetogenic drugs for type 2 DM
    - ◊ Diet and insulin: Restriction of diet along with insulin in type I DM and uncontrolled type 2 DM and in emergency situations.

C. **Long-term measures:** These measures are aimed at improving the quality of life by modifying the modifiable risk factors through health education.

D. **Evaluation:** Evaluation should be done to measure the extent to which diabetes has been controlled.

Q.2 Write complications (macrovascular and microvascular) of diabetes mellitus. *(RGUHS, 2012)*

Ans: Complications of diabetes mellitus:

A. **Macrovascular:**
- Coronary artery disease
- Cerebrovascular disease
- Peripheral arterial diseases

B. **Microvascular:**
- Eye disease
- Retinopathy (nonproliferative/proliferative)
- Macular edema
- Neuropathy (sensory, motor and autonomic)
- Nephropathy (albuminuria and declining renal failure)

C. **Others:**
- Gastrointestinal (gastroparesis, diarrhea)
- Genitourinary (uropathy/sexual disfunction)
- Dermatogenic
- Infections
- Cataracts
- Glaucoma
- Periodontal disease
- Hearing loss

Q43. Discuss self-care in diabetes mellitus. *(RGUHS, 2011; TDMC, 2015; SMU, 2014; MGUB, 2022; KUHS, 2018)*

Ans: Self-care in diabetes mellitus means that a diabetic patient should take a major responsibility for own care as per guidance of family physician.

Components:

- **Personal hygiene:**
  - A diabetic person should maintain personal hygiene from head to toe.
  - He/she should take protective care of foot as follows:
    - For change in color, temperature, swelling, cracks and wounds
    - Always use diabetic footwear whiling
    - Keep the foot clean, dry and warm
    - To file the nail and not to cut them
    - Change the socks daily
    - To ensure that there is no stone or nail inside the footwear
- **Habits:**
  - Should avoid smoking
  - Alcohol
  - Steroids
- **Exercise:** Should perform moderate exercise daily
- **Diet:**
  - Strict avoidance of sweets, bakery products, fatty foods and junk foods
  - More intake of leafy vegetables and dietary fibers
  - Restricted intake of beet root, potato, sweet potato and refined cereal products like maida, noodles etc
  - Adequate intake of proteins
  - Avoidance of egg yolk
  - Small but frequent balanced meals
  - No fast and no feast
- **Treatment:**
  - Should take medicine regularly as prescribed
  - Should administer insulin by his/her own if required
- **Self-examination:**
  - Can examine blood glucose
  - Urine for sugar and protein.

Q44. Discuss the role of diet in the management of diabetes. *(ABKUS, 2015)*

Ans: Important role of diet in the management of diabetes are described in Q.39 and 43.

HYPERTENSION RELATED QUESTIONS AND ANSWERS

Q45. Discuss the epidemiology of hypertension with special reference to Indian context. *(MGUB, 2022; RUHS, 2018)*

Ans: The prevalence of hypertension among men aged 15–49 years was higher than among women. 15% men were hypertensive, 43% men had normal blood pressure and rest were prehypertensive. One percent were on antihypertensive medicines. For both men and women, the prevalence of hypertension increased with age.

The prevalence of hypertension is higher among Sikhs (24% for men and 16% for women), Jains (19% for men and 16% for women) and Buddhist 19%, than rest of the religious groups. There is a consistent increase in prevalence of hypertension with increase in body mass index for both men and women. 29% of obese

women and 38% of obese men were hypertensive. The prevalence of hypertension among women at 15–49 years ranges from 8% in Bihar to 18% in Sikkim and Assam.

For men, the prevalence ranges from 6% in Delhi to 31% in Sikkim. For both men and women, the North-Eastern states (except Meghalaya for men) have a higher prevalence than national average.

Define hypertension, discuss the modifiable and nonmodifiable risk factors and preventive measures of hypertension.

(WBUHS, 2015, 2017, 2019, 2021, 2023; MGUB, 2022; BNMUB, 2016, 2017, 2020; GITAMAP, 2023; RGUHS, 2012, 2013; TRIU, 2016, 2020; KIMS, 2021; SSUHSA, 2010, 2018; DU, 2015; TDMGRMU, 2010, 2012; SAMU, 2016; GOAU, 2023)

Definition of hypertension: Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is the commonest cardiovascular disorder posing a major public health challenge to population in socioeconomic and epidemiological transition.

Definition of hypertension is difficult and arbitrary. Sir George Pickering first formulated a concept that blood pressure in a population is distributed continuously as bell-shaped curve with no real separation between normotension and hypertension.

Systolic blood pressure less than 120 mm Hg and diastolic blood pressure less than 80 mm Hg are considered to be normal.

Arbitrarily both the systolic blood pressure being ≥140 mm Hg and the diastolic blood pressure being ≥90 mm Hg or any of them will be considered as hypertension.

It has modifiable and nonmodifiable risk factors.

(BNMUB, 2023; ABKUB, 2023; VNSGUS, 2023)

Modifiable risk factors:

Risk factors	Descriptions
Obesity	Obesity, particularly central obesity, indicated by increased waist-hip ratio, has been positively correlated with high blood pressure
Salt intake	There is increasing evidence that a high salt intake (7–8 g per day) increases blood pressure proportionately
Saturated fat intake	The evidences suggest that saturated fat raises blood pressure as well as serum cholesterol
Alcohol intake	High alcohol intake is associated with high blood pressure
Physical inactivity	It is an important predisposing factor of hypertension. With the advancement of modern amenities, sedentary lifestyles are more prevalent among general population
Stress	It implies a disorder initiated by tension or stress. It is an accepted fact that psychosocial factors operate through mental processes, consciously or unconsciously to produce hypertension
Socioeconomic status	Higher prevalence of hypertension have been reported in upper socioeconomic groups
OCP	Estrogen component of the pill is a risk factor of hypertension

Nonmodifiable risk factors:

Risk factors	Descriptions
Age	Blood pressure rises with age in both sexes and rise is greater with higher initial blood pressure. Age probably represents an accumulation of environmental influences and effects of genetically programmed senescence in body systems
Gender	Early in life, there is little evidences of a difference in blood pressure between the sexes. However, at adolescence, men display a higher average level. This difference is most evident in young and middle-aged adults. Later in the life, difference narrows and the pattern may even be reversed. Postmenopausal changes in the women may be contributory factor for this change
Genetic factors	Twin studies have confirmed the importance of genetic factors in hypertension. The blood pressure value of monozygotic twins is more strongly correlated than those of zygotic twins
Ethnicity	Population studies have consistently revealed higher blood pressure levels in black communities than other ethnic group. Average difference in the blood pressure between the two groups varies from slightly less than 5 mm Hg during 2nd decade of life to 20 mm of Hg during the sixth

Different levels of prevention in relation to hypertension *(AKUB, 2023; VBUTH, 2023)*

Preventive measures: It involves preventing the emergence and spread of hypertension risk factors and lifestyles that have not yet appeared or become endemic. This applies to the developing countries in particular. These countries should seek to preserve their traditional eating pattern and life styles associated low level of hypertension risk factors.

Primary prevention:

Population strategy: Control of hypertension is primarily a mass strategy. The strategy should therefore be based on mass approaches focusing mainly on control of risk factors in whole populations, not merely in individuals. The approach is based on the principle that small reduction of the average blood pressure level in total population can achieve the biggest reduction in the incidence of cardiovascular complications such as stroke and CHD. The aim should be to shift the whole risk factor distribution in the whole population in the direction of 'biological normality'.

Specific interventions (nonpharmacologic components in management of hypertension):

- **Dietary changes:** WHO expert committee considered the following dietary changes to be appropriate for populations:
  - Reduction of fat intake to 20–30% of total energy intake.
  - Consumption of saturated fats must be limited to less than 10% of total energy intake.
  - Reduction of dietary cholesterol to below 100 mg/1,000 kcal per day.
  - An increase in the complex carbohydrate consumption.
  - Avoidance of alcohol consumption.
  - Reduction of salt intake to 5 g daily or less.
- **Smoking:** The goal should be to achieve a smoke free society and several countries are progressing towards the goal. A comprehensive health program would be required which includes effective information and education activities.
- **Weight reduction:** The prevention and correction of overweight/obesity is a prudent way of reducing the risk of hypertension and indirectly CHD.
- **Physical activity:** Regular physical activity should be a part of normal daily life. Regular physical activity leads to a fall in the body weight, blood lipids and blood pressure. It is particularly important to encourage children to take up physical activities.
- **Behavioral changes:** Reduction of stress and smoking, modification of personal lifestyle could be profitable.
- **Health education:** The general public require preventive advice on all risk factors and related health behavior.
- **Self-care:** An important element in community-based health programs is patient participation. The patient is taught self-care, such as take his own blood pressure and keep a log book of his readings.

High-risk strategy: The aim of this approach is to prevent the attainment of level of blood pressure at which the institution of treatment would be considered. This approach is appropriate if the risk factors occur with very low prevalence in the community. Detection of high-risk subjects should be encouraged by the optimum use of clinical methods. Since hypertension tends to cluster in the families, the family history of hypertension and tracking of blood pressure from childhood may be used to identify individuals at risk.

Secondary prevention: The goal of the secondary prevention is to detect and control high blood pressure in affected individuals.

- **Early case detection:** It is a difficult task, because high blood pressure rarely causes symptoms until organic damage has already occurred and our aim is to control it before this happens. The only effective method of diagnosis of hypertension is to screen the population.
- **Treatment:** We try to scale down the high blood pressure to acceptable levels. The aim of treatment should be to obtain a blood pressure below 140/90, and ideally a blood pressure of 120/80. Control of hypertension

has been shown to reduce the incidence of stroke and other complications. There is a major concern for identifying and treating asymptomatic hypertension.

- **Patient compliance:** The treatment of high blood pressure must be life-long and this presents problem of patient compliance. It is defined as 'the extent to which patient behavior coincides with clinical prescription.' The compliance rate can be improved through education directed to patients, families and the community.

It must be seen as a continuation of primary prevention. The aim of the secondary prevention is to prevent the recurrence and progression of CHD. The principles governing secondary prevention are to prevent the recurrence and progression of CHD. The principles governing secondary prevention are the same as those already set out in the above condition like cessation of smoking, control of hypertension and diabetes, healthy nutrition and exercise promotion, etc.

Tertiary prevention: This is required for the patients who become disabled. Rehabilitation can be done medically, socially, vocationally.

Q47. What do you mean by essential hypertension? What is the prevalence in India? What prevention measures would you take to reduce the prevalence and complication due to hypertension? *(WBUHS, 2015)*

Ans: Hypertension is divided into primary and secondary. **Hypertension is called essential when causes are generally unknown.** In 90% of all cases of hypertension is essential hypertension. When some other disease process or abnormality is involved in its causation is called secondary hypertension. These involved diseases of kidney (chronic glomerulonephritis and chronic pyelonephritis), tumors of adrenal glands, congenital narrowing of aorta and toxemias of pregnancy, estimated about 10% cases of hypertension.

Preventive measures already discussed in Q.46

Q48. As 6th Semester student, you are required to conduct a research project on "prevalence of hypertension among medical students of your institute" within a period of 3 months. What type and design of epidemiological study will you adopt? Describe in brief the steps of the study. *(WBUHS, 2018; TRIU, 2021)*

Ans: A research project on "**Prevalence of hypertension among medical students of our institute"** can be done within 3 months of time period. Best option will be "cross-sectional descriptive study" due to time frame.

The steps will be as follows:

- **Definition of the problem (disease):** Problem is prevalence of hypertension among medical students of a medical college. Hypertension will be measured by me and my co-investigator. Standard operating procedure will be followed in each and every student. The student who will show the pressure of ≥140/90 mm Hg, (s)he will be identified hypertensive. This will be our operational definition of hypertension.
- **Defining the population of the community:** The study will be conducted among medical students both boys and girls of Prefinal and Final year MBBS (200). Written consent was obtained to conduct the study, already briefed about study. The following information will be gathered from the participants regarding age, gender, food habit, weight, height, exercise history, place of origin, co-morbidities, etc. Afterwards, data will be analyzed. The study participants will be assessed by two investigators.
- **Describing the distribution of the disease in relation to time, place and person:** Time distribution cannot be measured because the study will be cross-sectional in nature. Residence of the students will be considered in this study and thus place distribution can be identified. Age, gender, food habit, height, weight, etc., are few variables of this study person distribution can be done also.
- **Measurement of the disease:** Hypertension will be identified examining all the students. The number of students who are suffering from hypertension will be measured and thus their proportion can be easily measured from denominator 200 students.
- **Making comparison with known indices:** Hypertension is a common identifiable problem of any society, can be measured easily as data on such problem is readily available. The hypertensive problem of our

students can be compared with such known indices and higher or lower proportion of problems can be declared among our students. Hypothesis of causation also can be sought out.

- **Formulation hypothesis:** At the end of our study, we shall be able to formulate hypothesis which may generalize cause-effect relation among our students of our college. In this way prevalence of hypertension among students of our college may be achieved within a short period of time through a cross-sectional descriptive study.

Q49a. **A 35 years sedentary obese man with smoking habit is sound to have blood pressure of 126/100 mm Hg. How will you classify this blood pressure? Describe the management with special emphasis on diet of the person.** *(WBUHS, 2018)*

Q49b. **A 62 years old obese man (BMI 31) visits OPD. He is a current smoker and family history of early stroke of first degree relative. Blood pressure recorded as 170/96 mm Hg. Investigation shows that he has dyslipidemia and normoglycemia. Classify his hypertension status and enumerate different risk factors for CAD.** *(WBUHS, 2023; AKUB 2022)*

Ans: Systolic blood pressure less than 120 mm Hg and diastolic blood pressure less than 80 mm Hg are considered to be normal in adult population.

Arbitrarily both the systolic blood pressure being ≥140 mm Hg and the diastolic blood pressure being ≥90 mm Hg or any of them will be considered as hypertension. India is following the same guideline.

So, a 35 years sedentary obese man with smoking habit with blood pressure of 126/100 mm Hg will be hypertensive as per our guideline. Sedentary lifestyle, obesity and smoking may influence the blood pressure in poorer direction but it does not influence the classification.

Classification details are not required here but it can be said that this patient will fall in stage II hypertension **(Table 8.1)**.

Table 8.1: Classification of blood pressure measurements.

Category	Systolic (mm Hg)		Diastolic (mm Hg)
Optimal	<120	and	<80
Normal	120–129	And/or	80–84
High normal	130–139	And/or	85–89
Grade I hypertension	140–159	And/or	90–99
Grade II hypertension	160–179	And/or	100–109
Grade III hypertension	≥180	And/or	>110
Isolated systolic hypertension	≥140	and	<90

Source: Guidelines for measurement of arterial hypertension, Vol 39, European Heart Journal (2018)

Construct the answer from above discussion.

SHORT NOTES AND RELEVANT QUESTIONS ON HYPERTENSION

Q50. **Rules of halves.** *(WBUHS, 2017; ABKUB, 2006, 2022; RGUHS, 2014; TDMGRMU 2013; SAMU, 2016, 2022; TRIU, 2016; KIMS, 2017, 2024; AKUB, 2023; VNSGU, 2023)*

Ans: **"Rule of halves"** is a presentation of the ice berg phenomenon exhibited by the hypertension. It is demonstrated in the year 1970s which revealed that half of the hypertensive subjects in the general population in developing countries were aware of the condition, only about half of those aware of the problem were being treated and only about half of those treated were considered adequately treated **(Fig. 8.3)**.

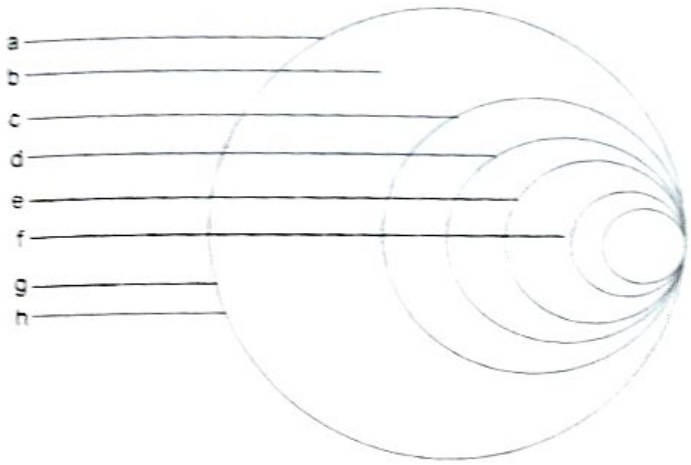


Fig. 8.3: Rule of halves.

The above alphabet stands for:
a. Whole community
b. Normotensive subjects
c. Hypertensive subjects
d. Undiagnosed hypertension
e. Diagnosed hypertension
f. Diagnosed but untreated
g. Inadequately treated
h. Adequately treated

Significance: "Rule of halves" represents the patient load of the hypertension which remain undiagnosed, nontreatment, inadequate treatment, etc.

Tracking of blood pressure. *(ABKUB, 2015, 2018; RGUHS, 2011, 2013; TRIU, 2020, 2023)*

Note: If blood pressure levels of individual were followed over a period of times from early childhood into adult life, the blood pressure (BP) of those individuals whose pressures were initially high in the distribution would probably continue in the same track as adults. In other words, those children with high BP may continue with high BP in adulthood also. This phenomenon of persistent rank of order of blood pressure has been described as tracking **(Fig. 8.4)**.

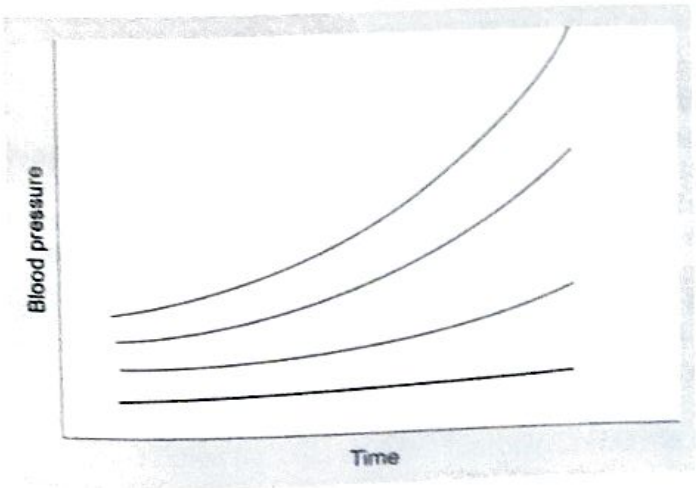


Fig. 8.4: Tracking of blood pressure.

Q52. DASH diet and its role in prevention of hypertension.

Ans: Research has found that diet affects the development of high blood pressure, or hypertension. Recent studies showed that following a particular eating plan, call the **DASH (Dietary Approach to Stop Hypertension)** diet, and reducing the amount of sodium consumed lowers blood pressure. The combination of the eating plan and a reduced sodium intake gives the biggest benefit and may help prevent the development of high blood pressure. Those diagnosed with high blood pressure especially benefit. Actually all adults can follow this heart healthy plan.

The following steps can help control high blood pressure:

1. Maintain a healthy weight
2. Be physically active
3. Stop smoking
4. Take blood pressure medicine as prescribed
5. Drink alcohol in moderation
6. Follow a healthy eating plan, including foods lower in salt

General principles of the DASH eating plan:

- Low in saturated fat, cholesterol and total fat
- High in fruits, vegetables, and low-fat dairy products
- Includes whole grain products
- Includes lean meats, fish and poultry and nuts
- Reduced in red meat, sweets and sugared beverages
- Rich in magnesium, potassium and calcium, protein and fiber

Tips on eating the DASH way:

- Eat a medium apple instead of cookies for dessert
- Have a hamburger that is 3 oz instead of 6 oz; add extra vegetables to your burger
- Instead of 5 oz of chicken, have a stir-fry with 2 oz of chicken and 1½ cups of raw vegetables. Use a small amount of vegetable oil
- Have a ½ cup serving of low-fat frozen yogurt instead of a chocolate candy bar
- Use low-fat or fat-free condiments
- If using regular margarine, mayonnaise or dressing, use half as much
- Use fat-free or low-fat dairy products
- Limit foods with a lot of added sugar such as sweets and soft drinks
- Eat fruits canned in their own juice
- Healthier snacks include fruit, raw vegetables, light popcorn, graham crackers, nuts or bread sticks
- Drink water instead of carbonated beverages

Tips to reduce salt and sodium:

- Choose low- or reduced- sodium, or no-salt-added versions of foods and condiments when available
- Buy fresh, plain frozen, or canned with "no-added-salt" vegetables
- Use fresh poultry, fish and lean meat, rather than canned, smoked or processed types
- Choose ready-to-eat breakfast cereals that are lower in sodium
- Limit cured foods (such as bacon and ham), foods packed in brine (such as pickled foods) and condiments (such as MSG, mustard, horseradish, and catsup). Limit even lower sodium versions of soy sauce and teriyaki sauce-treat these condiments just like salt)
- In cooking and at the table, flavor foods with herbs, spices, lemon, lime, vinegar or salt-free seasoning blends. Start by cutting salt in half
- Cook rice, pasta and hot cereals without salt. Cut back on instant or flavored rice, pasta and cereal mixes which usually have added salt
- Choose "convenience" foods that are lower in sodium. Limit frozen dinners, packaged mixes, canned soups and dressings

- Rinse canned foods, such as tuna, to remove some sodium
- Choose fruits or vegetables instead of salty snack food

CORONARY HEART DISEASE (CHD) RELATED QUESTIONS AND ANSWERS

Describe risk factors of coronary heart disease (CHD) in India. Describe the levels of prevention of disease, apply each level of interventions for prevention of CHD in a population.

(WBUHS, 2012, 2016; MGUB, 2022; AFUH, 2022; BNMUB, 2020; ABKUB, 2010, 2019; PBDSUHSH, 2017; RGUHS, 2013, 2015; SAMU, 2007; TDMGRMU, 2016, KIMS, 2013, 2021; SMU, 2014; TRIU, 2013; MUHS, 2019)

Ans: The etiology of CHD is multifactorial. They are modifiable and nonmodifiable.

Modifiable risk factors: *(KIMS, 2023; AKUB, 2023; VNSGUS, 2023)*

Risk factors	Descriptions
Smoking	Smoking has been identified as a major CHD risk factors with several possible mechanisms—carbon monoxide induced atherogenesis. Nicotine stimulation of adrenergic drive raises both blood pressure and myocardial oxygen demand. The degree of risk of developing CHD is directly related to number of cigarettes smoked per day
Hypertension	The blood pressure is the single most useful test for identifying individuals at a high risk of developing CHD. Hypertension accelerates atherosclerotic process, especially if hyperlipidemia is also present and contributes importantly to CHD
Serum cholesterol	Elevation of serum cholesterol was one of the factor which carried an increased risk for development of myocardial infarction. The risk of CHD rises steadily with the serum cholesterol concentration. LDL cholesterol is most directly associated with CHD. HDL cholesterol is protective against the development of CHD. To further refine CHD risk prediction based on serum lipid levels, a total cholesterol/HDL ratio has been developed. A ratio of less than 3.5 has been recommended as a clinical goal for CHD prevention. Recent evidence indicates that level of plasma apolipoprotein A-1 and Apolipoprotein B are better predictors of CHD than HDL or LDL cholesterol
Diabetes mellitus	The risk of CHD is 2–3 times higher in diabetics than in nondiabetics. CHD is responsible for 30–50% of deaths in diabetics over the age of 40 years in industrialized countries
Physical inactivity	Sedentary lifestyle is a greater risk of the development of early CHD. There is evidence that regular physical exercise increases the concentration of HDL and decreases both body weight and blood pressure which are beneficial to cardiovascular disease
Alcohol	High alcohol intake, defined as 75 gram or more is an independent risk factor for CHD, hypertension and all cardiovascular diseases
Hormone	The pronounced difference in the mortality rates for CHD between male and female subjects suggests that the underlying factors may have a hormonal basis
Stress	In modern age, stress at workplace and home is increasing due to various reasons, which is an important risk factors of CHD

Nonmodifiable risk factors: *(KIMS, 2023)*

Risk factors	Descriptions
Age	Risk of CHD is increasing after 40 years
Genetic factor	**Genetic factor:** A family history of CHD is known to increase the risk of premature death. Genetic factors are probably the most important determinants of a given individual's LDL level. However, the importance of genetic factors in the majority of the case is unknown
Type A personality	Type A behavior is associated with competitive drive, restlessness, hostility and a sense of urgency. Type A individuals are more commonly prone to CHD
Family history	Positive family history is an important risk factor of CHD

Prevention of CHD:

Primordial prevention: It involves preventing the emergence and spread of CHD risk factors and lifestyles that have not yet appeared or become endemic. This applies to the developing countries in particular. These countries should seek to preserve their traditional eating pattern and life styles associated low level of CHD risk factors.

Primary prevention:

Population strategy: CHD is primarily a mass strategy. The strategy should therefore be based on mass approaches focusing mainly on control of risk factors in whole populations, not merely in individuals. The approach is based on the principle that small changes in risk factor levels in total population can achieve the biggest reduction in mortality. That is the aim should be to shift the whole risk factor distribution in the whole risk factor distribution in the direction of "biological normality."

Specific interventions:

Dietary changes: WHO expert committee considered the following dietary changes to be appropriate for populations:

- Reduction of fat intake to 20–30% of total energy intake.
- Consumption of saturated fats must be limited to less than 10% of total energy intake.
- Reduction of dietary cholesterol to below 100 mg/1,000 kcal per day.
- An increase in the complex carbohydrate consumption.
- Avoidance of alcohol consumption.
- Reduction of salt intake to 5 g daily or less.

Smoking: The goal should be to achieve a smoke free society and several countries are progressing towards the goal. A comprehensive health program would be required which includes effective information and education activities.

Blood pressure: It has been estimated that even a small reduction in the average blood pressure of the whole population by a mere 2–3 mm Hg would produce a large reduction in the incidence of cardiovascular complications.

Physical activity: Regular physical activity should be a part of normal daily life. It is particularly important to encourage children to take up physical activities.

High-risk strategy (identifying risk): High-risk intervention can only start once those at high risk have been identified. By means of simple tests such as blood pressure and serum cholesterol measurement, it is possible to identify individuals at special risk. Individuals at special risk also include smokers, those with a strong family history of CHD, young woman using oral contraceptive, diabetes and obesity.

Specific advice: Having identified those at high risk, the next step will be to bring them under preventive care and motivate them to take positive actions against all the identified risk factors, e.g., elevated blood pressure should be treated, smokers should be helped to break the smoking habit permanently and serum cholesterol concentration should be reduced if already raised.

Secondary prevention: It must be seen as a continuation of primary prevention. The aim of the secondary prevention is to prevent the recurrence and progression of CHD. The principles governing secondary prevention are to prevent the recurrence and progression of CHD. The principles governing secondary prevention are the same as those already set out in the above condition—cessation of smoking, control of hypertension and diabetes, healthy nutrition and exercise promotion, etc.

The most promising results to date have come from beta-blocker which appear to reduce the risk of CHD mortality in patients who have suffered at least one infarct in the order of 25%. Surgical methods may be also required in certain indications like-angina pectoris.

Revascularization procedures for patients with angina pectoris

The indications for coronary artery revascularization, i.e., coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA) in patients with angina pectoris.

Tertiary prevention: This is required for the patients who become disabled. Rehabilitation can be done medically, socially, vocationally.

Q54. How do you measure the burden of coronary heart disease (CHD) in the community? *(RGUHS, 2012; ABKUB, 2000)*

Ans: Measuring the burden of coronary heart disease in the community:

- **Proportional mortality rate:**
  - It is proportion of all death attributed to coronary heart disease
  - It is the simples measure
- **CHD incidence rate:**
  - It is the sum of fatal and nonfatal attack rates
  - Disease manifestation vary person to person so accurate measurement is difficult
  - Mortality rate can give the surest data
- **Prevalence rate:** It can be estimated from ECG and history of prolong chest pain
- **Age-specific death rates:** It suggests true picture
- **Case fatality rate:** It is the proportion of attacks that are fatal upon the affected persons.
- **Measurement of risk factors level:** Through measurement of level of cigarette smoking, blood pressure, alcohol consumption and serum cholesterol.
- **Facilities of medical care available in the community:** Tertiary and specialized hospitals.

RHEUMATIC HEART DISEASE (RHD) RELATED QUESTIONS AND ANSWERS

Q55. Describe burden and natural history of RHD. What are the criteria for diagnosis of rheumatic fever and rheumatic heart disease? What are the nontherapeutic measures of prevention of rheumatic heart disease? *(WBUHS, 2019)*

Ans: What is rheumatic fever (RF)

RF occurs following sore throat caused by GAS. It is a multisystem disease. Child may develop painful or swollen joints (knee, elbow, ankle and wrists, etc.), with or without fever, about 1–5 weeks after GAS infection in throat. If RF progresses to RHD, then the damage to heart is irreversible.

Burden of RHD in India: Prevalence of RHD in India, is estimated around 0.9 cases per 1000 children in the 5–14 years age groups, estimated about 2.18 lakh cases of RHD in the country on the basis of 20% of population of 5–14 years age group. About 30% of the sore throats in the children aged 5–15 years are caused by **group A β-hemolytic streptococci (GAS)** and about 0.3–3% of untreated GAS infection results in rheumatic fever and about 50–90% of those cases of RF eventually develop cardiac complications like heart valve damage, cardiac failure, etc.

Natural history of RHD:

- **Agent:** GAS which caused throat infections, can easily spread from one child to another. GAS infection causes inflammation of heart (carditis), untreated and repeated infections cause permanent scarring/ damage of heart valves.
- **Host:** Commonest age group involved is 5–15 years. Affect both sex equally but prognosis is worse for females than for males.
- **Environment:** Poor ventilation, overcrowded slums, unhygienic conditions, poverty, malnutrition and inadequate access to medical care.

RH and RHD diagnosed, based on revised Jones criteria: Two major or one major and two minor manifestations plus evidence of a preceding GAS infection within the last 45 days

Manifestations	*Features (sign and symptoms)*
Major manifestations	• Carditis • Polyarthritis • Erythema marginatum • Subcutaneous nodules
Minor manifestations	• Clinical: Fever, polyarthralgia • Laboratory: Raised ESR or leukocyte count
Supportive evidence	• ECG—prolonged PR interval • Elevated ASO titer • A positive throat-culture • Recent scarlet fever

Prevention: *(ABKUB, 2023)*

Primordial prevention: Minimize the exposure to Group A-β hemolytic streptococci (GAS) in the community

- Awareness generation through health education by health worker in the community, school health program, immunization sessions, village health and sanitation committee meetings, VHND, outreach sessions and Mahila Mandal meetings, etc.
- **Improving housing conditions:** Reduction of overcrowding in slums, improvement of ventilation facilities, improvement of nutritional status of young children.
- **Poverty alleviation:** Availing facilities of different program run by state and central government.

Primary prevention: Detection of streptococcal pharyngitis and its management:

- Identification of GAS infection among children in 5–15 years age group followed by treatment with appropriate antibiotics
- Prevention of recurrence of GAS infection

Prevention of bacterial sore throat among the children: It is highly contagious, can spread from one child to another by:

- Coughing and sneezing
- Poor hand hygiene
- Sharing food and drinks

Proper cough hygiene and oral hygiene are important to prevent spread of infection:

- Wash hand frequently
- Keep teeth clean, brush twice daily
- Cover month while cough and sneezing

Secondary prevention: Early diagnosis and management of RF and RHD by regular administration of penicillin injection to a child who is at risk of RF recurrence. One RF is diagnosed, the child should be treated with benzathine penicillin injection or erythromycin if sensitive to penicillin. It is given deep intramuscular (thigh or gluteal region), once in every 3 weeks as advised by family physician. Duration of treatment is long time according to different categories. Healthcare providers have to convinced the parents about the importance of the injections in order to avoid recurrence of episodes of RF.

Tertiary prevention: Disability limitation by valve replacement and vocational rehabilitation.

Nonmedical measures for prevention of RHD:

- Improvement of living conditions as well as ventilation
- Improvement of socioeconomic condition by breaking poverty-disease-poverty cycle
- Improvement of nutritional status of young children

Evaluation: Periodic random survey in the schools (5–15 years age groups of children) at 5 years intervals

OBESITY RELATED QUESTIONS AND ANSWERS

Q56. Define obesity and overweight. How will you assess obesity? What are the ways to prevent and control obesity? *(BNMUB, 2015, 2016; RGUHS, 2010; SMU, 2010, 2011; BUMP, 2016; TDMGRMU, 2013; NU, 2015; GOAU, 2021; DBRAUA, 2024; SDVPG, 2023)*/**BMI is not the only method for the measurement of obesity.** *(WBUHS, 2019)*

Ans: Obesity may be defined as an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyperplastic obesity) or a combination of both.

Overweight is usually due to obesity but can arise from other causes such as abdominal muscle development or fluid retention.

For assessment of obesity on the basis of body composition, the following issues may be considered: *(ABKUB, 2023)*

a. The active mass (muscle, liver, heart, etc.)
b. The fatty mass (fat)
c. The extracellular fluid (blood, lymph, etc.)
d. The connective tissue (skin, bones, connective tissue)

The state of obesity is characterized by an increase in fat mass at the expense of the other parts of the body. The water content of the body is never increased in case of obesity.

The widely used criteria for identification of obesity are given below:

- **Body weight:**
  a. Body mass index (BMI)
     - $\text{BMI} = \frac{\text{Weight (in kg)}}{(\text{Height in meter})^2}$
     - Broca's index = Height in cm –100

     For example, if a person's height is 160 cm, his ideal weight will be (160 – 100) = 60 kg
     - Corpulence index (CI)

     $\text{CI} = \frac{\text{Actual weight}}{\text{Desired weight}}$

     This should not exceed 1.2
- **Height:**
  - Ponderal index $= \frac{\text{Height in cm}}{\text{Cube root of body weight (kg)}}$

The BMI and Broca's index are widely used. FAO/WHO used BMI table as international reference standards.

- **Skinfold thickness:** It is rapid and noninvasive methods for assessment of body fat. The measurement may be taken at all the four sites—mid-triceps, biceps and sub-scapular and supra-iliac regions. Several varieties of calipers are being used for measurements of skinfold thickness.
- **Interpretation:** The sum of the measurements should be less than 40 mm in boys and 50 mm in case of girls.
- **Waist circumference and waist-hip ratio (WHR):** Waist circumference is measured at the mid-point between the lower border of the rib case and the iliac crest. It is a convenient and simple measurement that is unrelated to height, correlates closely with BMI and WHR and is an approximate index of intra-abdominal fat mass and total body fat. Changes in waist circumference reflect changes in risk factors for cardiovascular disease and other forms of chronic diseases. There is an increased risk of metabolic complications for men with a waist circumference ≥102 cm and women with a waist circumference ≥88 cm. Over the past 10 years, it is accepted that a high WHR (>1.0 in men and >0.85 in women) indicated abnormal fat accumulation.

- **Others:** For the estimation of body fat, other 3 (three) measurements are being used viz., total body water, total body potassium and body density. But these techniques are complex, hence cannot be used in routine clinical and epidemiological.

The hazards of obesity are listed below:

Obesity is a health hazard and detriment to well-being and reflected by increased morbidity and mortality.

- **Increased morbidity:** Obesity is the positive risk factors for:
  - Hypertension, diabetes, coronary heart disease, gallbladder disease, cancer especially hormone related and large bowel cancer.
  - Obesity may me be associated with other diseases though not usually fatal like varicose vein, abdominal hernia, osteoarthritis of knees, hip, etc.
  - Obesity may lead to infertility.
- **Increased mortality:**
  - Obesity may lead to death due to hypertension, coronary heart disease and renal diseases.
  - Obesity lowers life expectancy.

Prevention and control of obesity:

- **Weight control:**
  - Range of BMI in the range of 18.5–24.9 throughout the adulthood
  - Those who are already overweight, should accept reduction of 5–10% of body weight and it is recommended as an initial goal.
- **Dietary changes:**
  - Carbohydrate and fat should be reduced.
  - Fiber content in diet should be increased.
  - Most conventional diet for weight reduction are based on 1,000 kcal daily model for an adult.
  - Basic concept is that food energy intake should not be greater than energy expenditure.
  - Patient's behavior and strong motivation is very important to lose weight.
- **Increased physical activities:** Regular exercise is the key to increased energy expenditure.
- **Others:**
  - Surgical treatment like gastric bypass, gastroplasty, etc.
  - Health education has an important role for controlling obesity.

CANCER RELATED QUESTIONS AND ANSWERS

Q57. Discuss in detail about the multifactorial etiology of cancer. Add a note on the basic approach to control of cancer. *(WBUHS, 2020; AKUB, 2022; ABKUB, 2019; TDMGRMC, 2014)*

Ans: Cancer has a multifactorial etiology.

A. **Environmental factors:**

- *Tobacco:* It uses in various ways, e.g., smoking, chewing. It causes cancers of lungs, larynx, mouth, pharynx, esophagus, bladder, pancreas, etc.
- *Alcohol:* Excessive intake of alcoholic beverages is associated with esophageal and lever cancer.
- *Dietary factors:* Dietary factors are related to cancer
  - Smoked fish is related to stomach cancer.
  - Dietary fiber to intestinal cancer
  - Beef consumption to bowel cancer
  - High fat diet related to breast cancer
- *Occupational exposures:*
  - Exposure to benzene, arsenic, cadmium, chromium, vinyl chloride, asbestos, polycyclic hydrocarbons, etc.
  - Risk of occupational exposure increased if the individual is a smoker.

- *Viruses:*
  - Viruses may be related to cancer
  - Hepatitis B and C cause hepatocellular carcinoma
  - Kaposi's sarcoma occurring in patient with HIV infection
  - Epstein-Barr virus is associated with Burkitt's lymphoma and nasopharyngeal carcinoma.
  - Human papilloma virus is associated with cancer cervix.
- *Parasites:* Schistosomiasis is associated with carcinoma of bladder
- *Customs, habits and lifestyles:*
  - Smoking is associated with lung cancer
  - Tobacco and betel chewing associated with oral cancer
- *Others environmental factors:* Sunlight, radiation, air and water pollution, medication (estrogen) and pesticides which are related to cancer.

2. **Genetic factors:**
   - Retinoblastoma occurs in children with same parents
   - Mongols are more likely to develop leukemia.

Cancer control:

Primary prevention *(SAMU, 2022)*

- **Control of tobacco and alcohol:** Control of tobacco smoking and alcohol may reduce tobacco related and alcohol related cancer deaths.
- **Personal hygiene:** Improvements in personal hygiene may decline in incidence of certain types of cancer, e.g., cancer cervix.
- **Radiation:** Special effort should be made to reduce the amount of radiation including medical radiation.
- **Occupational exposure:** Measures to protect workers from exposure to industrial carcinogens should be enforced in industries.
- **Immunization:** Immunization against hepatitis B virus and human papillomavirus may protect primary liver cancer and cancer cervix respectively.
- **Foods, drugs and cosmetics:** These should be tested for carcinogens.
- **Treatment of precancerous lesion:** Early detection and prompt treatment of precancerous lesions such as cervical tears, intestinal polyposis, warts, chronic gastritis, chronic cervicitis helpful for cancer prevention.
- **Legislation:** Legislation for control of environmental carcinogens, e.g., tobacco, alcohol and air pollution.
- **Cancer education:** Motivate people to follow on early warning signs (danger signals) of cancer **(You are referred to Long Essay Question 58)**

Secondary prevention: It includes cancer registry and treatment.

Cancer registry. *(WBUHS, 2016, 2024; TDMGRMU, 2012; RGUHS, 2011, 2012; KIMS, 2016; DU, 2015; BNMUB, 2020; RUJH, 2021; SSUHSA, 2023)*

Ans: Cancer registration is a secondary prevention measure for cancer control. A uniform data should be registered as per WHO handbook for Standardized Cancer Registers.

Types of cancer registry:

1. **Hospital-based registries:** It includes all outpatients attending hospital and inpatients of the hospitals admitted in the institute.
   Advantages: Important to evaluate diagnostic and treatment program.
   Disadvantages: Selected proportion of population reported in hospital.
2. **Population-based registries:** It covers cancer situation in a geographic area.
   Advantages: It provides incidence rate and also it is a useful tool because we came to know causes of cancer, surveillance time trends, evaluation of operational activities.
   Disadvantages: Large population have to cover.

Early detection: Cancer screening is the main weapon for early detection of cancer at a preinvasive (in-situ) or premalignant stage. Effective screening program have been developed for cervical, breast and

oral cancer. Early diagnosis should be conducted on a large scale and it should focus on high-risk groups also.

Treatment: Certain forms of cancer are amenable to surgical removal, while some others respond to radiation or chemotherapy or both. Multimodality approach to cancer control has become a standard protocol all over the world. For those who are beyond the curable stage, the goal must be to provide pain relief.

Tertiary prevention: This is required for the patients who become disabled. Rehabilitation can be done medically, socially, vocationally.

Q58. What are the early (danger/warning) signs of cancer? Describe in brief the epidemiology of oral cancer and methods of its different levels of its prevention in the community.

(WBUHS, 2008, 2009, 2013, 2021; MGUB, 2023; RGUHS, 2011, 2014; TDMGRMU, 2016; SMU, 2014; NU, 2015; SSUHSA, 2018; GNSUB, 2023; VNSGUS, 2023; RUJH, 2024)

Ans: Early (danger/warning) signs of cancer: *(MGUB, 2024)*

It is described through the following pneumonic, CAUTION US

C—Change in bowl and bladder habits
A—A wound that does not heal
U—Unusual bleeding or discharge
T—Thickening or lump in the breast
I—Indigestion or difficulty in swelling
O—Obvious change in wart or mole
N—Nagging cough or hoarseness of voice
U—Unexplained anemia
S—Sudden weight loss

Q58a. Cancer education.

(BNMUB, 2012; KIMS, 2019)

Ans: Cancer education is one of the important strategies for primary prevention of cancer. It should be directed at high-risk groups.

Aim of the cancer education: Cancer education will be able to motivate the people to seek early diagnosis and early treatment. Cancer organization in many countries reminds the early warning signs (danger signals) of cancer.

Q58b. Epidemiology of oral cancer.

Ans: For the year 2012, with estimated incidence of 10.1 cases per 1,00,000 population for males and 4.3 per 1,00,000 population in females, oral cancer is a major problem in India. The estimated mortality is about 6.7 per 1,00,000 in males and 3.0 per 1,00,000 in females.

Following epidemiological features are important:

Tobacco: Approximately 90% of the oral cancer in South-East Asia are linked to tobacco chewing and smoking. Different studies indicate the below mentioned issues.

- Oral cancer and precancerous lesions almost occur solely among those who smoked or chewed tobacco.
- Oral cancer was almost always preceded by some type of precancerous lesions.
- Oral cancer almost always occurred on the site where tobacco quid was kept.

Alcohol: Alcohol appears to have a synergistic effect in tobacco users.

Precancerous stage: The natural history of oral cancer shows that often a precancerous stage precedes the development of cancer. The precancerous lesions can be detected for up to 15 years prior to their change to an invasive carcinoma.

High-risk groups: Tobacco chewers and smokers, bidi smokers, people using tobacco in other forms such as betel quid, people who sleep with the tobacco quid in the mouth are at high risk.

Cultural patterns: In studying the tobacco habits in developing countries, indigenous form of smoking as well as chewing are characteristic of certain regions have to be taken into account. Tobacco is smoked in the form of manufactured cigarettes. The indigenous forms of smoking are bidi, chutta, chillum, hookah are risk factors for oral cancer. Tobacco in powdered form is inhaled as snuff.

Primary prevention of oral cancer: Oral cancer is amenable to primary prevention. If the tobacco habits are eliminated from the community, a great deal of reduction of the incidence of the oral cancer can be achieved.

Different measures for primary prevention:

- **Public information and education:** Public awareness should be created about hazards of tobacco chewing and smoking through mass media (TV, Radio, Newspaper, Poster, etc.), and group approach (lecture, demonstration, etc.).
- **Health educator:** Dental surgeons, healthcare workers, school teachers, AWWs, etc.
- **Target group:** Young population, school children, slum population, tribal population, etc.

Content of health education:

a. Risk factors of oral cancers
b. Hazards of tobacco smoking and chewing
c. Common precancerous lesion of oral cancer

Legislative and restrictive measures: Following legislation and restrictive measures have been suggested in the following areas:

- Health warnings on cigarette packets and advertisements
- Control of sales promotion
- Imposition of upper limits for harmful substances in smoking material
- Taxation
- Restriction of smoking in public places and in places of work

The Government of India have provided legislative support to the antismoking campaign. The Cigarettes (Regulation of Production, Supply, and Distribution) Act of 1975 which requires all manufacturers or persons trading in cigarettes to display prominently the statutory warning is **"Cigarette smoking is injurious to health"**.

Smoking cessation activities: The basic role of most treatment for smoking cessation would be to relieve the smokers of abstinence symptoms like sleeplessness, craving for smoking, dizziness, constipation, etc. It was reported that 90% of those who give up smoking do so their own volition, i.e., without use of any specific therapy.

Secondary prevention: Oral cancers are easily accessible for inspection allowing early detection. If it is detected at precancerous stage, they can be treated or cured. The precancerous lesions can be detected for up to 15 years, prior to their change to an invasive carcinoma. Leukoplakia can be cured by cessation of tobacco use.

The primary healthcare staffs (multi-purpose workers) are able to detect or suspect oral cancers at an early stage during their home visits. In suspected case, they will be referred to higher center like PHC, BPHC/RH/CHC, Subdivisional or District Hospitals, Medical College Hospitals, Tertiary Cancer Care Hospital and accordingly they can be treated there.

Tertiary prevention: Strengthening of the existing institutions of comprehensive therapy including palliative therapy.

Q30. What is the methods of screening for cancer? *(RGUHS, 2003; SMU, 2010)*

Ans: Cancer screening is defined as **"Search for unrecognized malignancy by means of rapidly applied tests"**.

Principle of cancer screening:

- In many instances, malignant disease is preceded for a period of months or years by a premalignant lesion and removal of which prevents subsequent development of cancer.

- Most cancers begin as localized lesions and if cured at this stage, high cure rate is obtained.
- As much as 75% of cancers are accessible for screening.

Methods of cancer screening:

- **Mass screening by comprehensive cancer detection examination:** A rapid clinical examination of one or more body sites by the physician is one of the important approaches for cancer screening.
- **Mass screening at single sites:** This comprises examination of single sites such as uterine cervix, breast and lung, etc.
- **Selective screening:** Examination of those people who are at special risks, examples chronic smokers for lung cancer, porous women of more than 35 years of age with lower socioeconomic strata detection of cancer cervix.

Cancer screening in women: Most common cancers in women are cervical and breast cancer.

- **Screening of cervical cancer**
  - All women should undergone, Pap test at the beginning of sexual activity and then every 3 years along with periodic pelvic examination
  - Visual examination with acetic acid could be also done
- **Screening for breast cancer**

  Methods:
  - Breast self-examination by patient
    - All women should be encouraged to perform breast self-examination
    - It is more frequently found by patients themselves than by a physician during routine examination
    - It is a useful adjuvant to early case detection
    - Palpation is unreliable for large fatty breasts
  - Palpitation by physician: In high-risk groups cases or cases with lump in breast are examined by physician.
  - Thermography:
    - A safe method but not sensitive
    - Advantage is found that patient is not exposed to radiation
  - Mammography:
    - Most sensitive and specific tool
    - Can detect small masses that may be missed on palpation
    - Can be employed in selective screening

  Disadvantages:
  - Exposure to radiation (500 milliroentgen)
  - Requirement of technical equipment of a high standard and radiologists with very considerable experience
  - Biopsy from a suspicious lesion may end up on a false-positive
- **Screening for endometrial cancer methods:**
  - Pap smear not useful
  - Ultrasonography
  - Office endometrial washing
  - Color flow imaging

Cancer screening for both sexes: Lung cancer

In lung cancer, primary prevention is of greatest importance. The most promising approach is to control the smoking epidemic, because 80-90% of all cases in lung cancer are due to smoking of cigarettes in developing countries. Broadly, the methods of primary prevention include the following:

- The need of the hour is to create public awareness about the hazards of smoking through mass media. The target population should be the entire population with greater emphasis laid on young people and school children

- Legislation and restrictive measures
- National and international coordination

Legislation and restrictive measures have been suggested in the following areas:
- Control of sales promotion and sales restriction
- Health warnings on cigarette packets and advertisements
- Product description showing yield of harmful substances
- Imposition of upper limits for harmful substances in smoking materials
- Restriction of smoking in public places like railway premises, restaurants, etc.
- Research continues on different methods of smoking cessation. The basic role of most treatments for smoking cessation would be to relieve the smoker of abstinence symptoms (sleeplessness, craving for smoking, dizziness, etc.).

Diagnostic technique:
- Chest radiography
- Mass radiography at 6 monthly interval is suggested for early diagnosis
- Sputum cytology

Significance: Cancer screening is most important secondary prevention tool to prevent mortality and morbidity from cancer as most cancers are amenable to treatment when detected early.

Q. Enlist common causes of cancer among males and females in India. Enumerate the cancers more frequently found in India. Write briefly epidemiology, prevention and control of cancer cervix in India.
(WBUHS, 2023, 2009; BNMUB, 2021; ABKUB, 2013; GNSUB, 2022; DU, 2014; KIMS, 2019; AFUH, 2023; MGUB, 2024)

Ans: **Common causes of cancer among males in India:**
- Lip and oral cavity
- Lung
- Esophagus
- Stomach
- Colorectum
- Prostate

Common causes of cancer among females in India:
- Breast
- Cervix uteri
- Ovary
- Lip and oral cavity
- Colorectum
- Esophagus and stomach

Common cancers in India:
- Oral cancer
- Cervical cancer
- Lung cancer
- Breast cancer
- Cancer stomach
- Colorectal cancer, etc.

Epidemiology of carcinoma cervix: Cancer cervix is second most common killer disease among female after breast cancer in India. It is estimated that during 2012, about 1,22,644 new cases of cancer cervix occurred in India, incidence rate 22 per lakh population and about 67,477 women died of disease, mortality rate 12.4 per lakh. It represents 20.7% of all cancer deaths in women and 9.9% of total cancer deaths in the country.

Risk factors of carcinoma cervix:

- **Age:** It affects relatively young women with incidence increasing rapidly from the age of [illegible] reduced and again affects older age groups.
- **Marital status:** Cases are less in unmarried/single, more in widowed, divorced or separated [illegible] multiple sexual partners. It is common among prostitutes and virgins.
- **Early marriage:** Early marriage, early coitus, early childbearing and repeated child birth [illegible] with higher risk.
- **Genital warts:** Past/present occurrence of clinical genital warts are important risk factors.
- **Oral contraceptive pills:** Possible relationships between pill use and invasive cancer cervix.
- **Socioeconomic status:** Common in lower socioeconomic groups probably due to poor [illegible] hygiene.

Preventive measures against carcinoma cervix: Preventive measures include primary, secondary and tertiary prevention.

Primary prevention: There are two strategies: **Population strategy and high-risk strategy.**

In **population strategy**, preventive measures are applied on entire population. In high-risk strategy preventive measures are applied on high-risk groups. High-risk groups are commonly considered as following groups:

- Commercial sex worker
- Multiparous women of lower socioeconomic group
- Mothers above 35 years of age
- Women having multiple sex partners
- Women having bleeding disorders

Primary prevention includes **health promotion and specific protection.**

Health promotion: The women are made cancer conscious by educating about risk factors, preventive measures of cervical carcinoma and warning signs of cancer such as bleeding after coitus and postmenopausal bleeding.

Specific protection: Two types of vaccines are available for prevention of human papillomavirus (HPV) infection, namely **Gardasil and Cervarix.**

Secondary prevention: It includes early diagnosis and treatment. The aim of the secondary prevention is to make an early diagnosis of cancer for early treatment. This is done by screening procedure.

A. **Early diagnosis:**

- *Cancer screening:* It is an ideal disease to be diagnosed early by screening because of the following favorable points. It is preceded by a premalignant localized lesion such as cervical tear, chronic cervical erosion, etc.
- *Screening procedures:* **Pap smear examination for exfoliative cytology.** This procedure not only helps in early detection of case, but also prevents them from developing invasive cancer. Now the current policy is that all woman should undergo a Pap test regularly once in three years and also a thorough pelvic examination. There are two problems encountered in screening for carcinoma cervix.
  1. Problems related to the disease: The frequency with which the preinvasive stage progresses to invasive stage is unknown. The frequency with which invasive cancer is preceded by abnormal smear is unknown.
  2. Problems related to test are two in number:
     i. Response rate: Many mothers of illiterate and poor socioeconomic status cannot reach the screening camp.
     ii. Sensitivity of the Pap test: It is the ability of the Pap test to identify correctly all those who have the disease. Pap smear test has a sensitivity of 80%. The percentage of false negative can be reduced by taking the smear correctly by expert pathologists.

Alternative screening procedures other than Pap test:

- *Visual inspection with 5% acetic acid (VIA):* The present strategy is to screen the women using visual inspection after application of 5% acetic acid solution. Detection of well-defined opaque acetowhite lesion close to the squamocolumnar junction, well-defined circumorificial acetowhite lesion or dense acetowhitening of ulceroproliferative growth constitutes a positive VIA.
- Visual inspection with 5% acetic acid and magnification (VIAM)
- Visual inspection post application of Lugol's iodine (VILI)
- Colposcopic examination of high-risk women

Thus, the screening procedure is the main weapon for early detection of cancer, so that incidence and the mortality rate can be reduced. The patients, who show some positive features on screening, can be referred for further costly diagnostic procedure like CT scan, MRI, etc.

B. **Treatment:** Aim of the treatment is to cure and to prevent complications. Treatment of cervical carcinoma is multimodality approach.

- *Surgery:* Total/subtotal/pan hysterectomy
- Radiotherapy
- Chemotherapy

Tertiary prevention: Tertiary prevention is by rehabilitation for all those who have become disabled following major surgery like total hysterectomy. They are rehabilitated medically, socially, mentally.

Q61. Discuss the epidemiology and prevention of breast cancer in India. *(WBUHS, 2024; BNMUB, 2019; GOAU, 2023; RUJH, 2024; RGUHS, 2024)*

Ans: Breast cancer was estimated to cause 6.1 deaths per 1,00,000 Population in India (2016). A total of 80,700 women died of breast cancer in India (2016).

Risk factors:

- **Age:** It is uncommon below the age of 35, incidence increasing rapidly between the age of 35–50. Secondary rise seen after the age of 65. Women who developed their first breast cancer under the age of 40, had 3 times the risk of developing a second breast cancer than did those who developed their first cancer after the age of 40.
- **Family history:** Positive family history of breast cancer specially mother or sister having higher risk.
- **Parity:** If 1st pregnancy is delayed by late thirties having higher risk than multiparous women. Unmarried women tent to have more breast cancer than married single women and nulliparous.
- **Age at menarche and menopause:** Early menarche and late menopause having more risk. Forty or more years of menstruation doubles the risk as compared to 30 years.
- **Hormonal factors:** Elevated estrogen and progesterone having more risk.
- **Prior breast biopsy:** Prior breast biopsy associated with higher risk.
- **Diet:** High fat diet and obesity influences breast cancer.
- **Socioeconomic status:** Common in higher socioeconomic groups, more risk at higher age at 1st birth.
- **Radiation:** Increased risk women exposed to radiation

Prevention:

Screening:

- **Primary prevention:** Elimination of risk factors breast cancer through promotion of cancer education. The average age of menarche can be increased through reduction of childhood obesity and an increased strenuous physical activity. Reduction of fat intake.
- **Secondary prevention:** Screening leads to early diagnosis which influences treatment and mortality. Proper follow up to detect recurrence as early as possible also detect carcer early in opposite breast. As per current treatment, some cases progress rapidly, some cases survive for 20 years even after metastatic spread. However, removal of tumor in early stage is more likely to be curative than removal at a later stage.
- **Tertiary prevention:** Disability limitation and rehabilitation.

Q62. Micronutrient in cancer(s). *(TDMGRMC, 2002)*

Ans: Micronutrients have protective influence for causation of cancer. Deficiency of vitamin A is associated with cancer lung and other sites. Deficiency of vitamin C is related to risk of stomach cancer because vitamin C inhibits formation of carcinogenic nitrosamines in the stomach. Trace elements (Selenium) have also been implicated in the etiology of cancer.

Although adequate intakes of micronutrients do not guarantee protection against cancer, studies have shown that people who consume insufficient quantities in the long-term have a considerably higher risk of developing some types of cancer. As antioxidants and enzymatic co-factors, vitamins and other micronutrients are involved in many physiological processes which serve to maintain cell structures and functions, including the repair and maintenance of DNA. Inefficient or even faulty repairs to DNA due to a lack of nutrients lead to genome instability, which in turn can lead to an increased risk of developing cancer. Micronutrients are essential for the regulation of intercellular communication, inhibition of certain cancer-promoting substances and strengthening the immune system. The extent to which an adequate nutrient intake offers protection is dependent on many other factors, including lifestyle and the type of cancer.

Q63. Describe the objectives, components and strategies of National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS)/NP-NCD.

(TRIU, 2022; KIMS, 2021; PBDSUHSH, 2015; NIMSUR, 2015; DBRAUA, 2024)

Ans: Considering the rising burden of NCDs and common risk factors to major chronic noncommunicable diseases, Government of India initiated an integrated National Program for Prevention and Control of Cancers, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) under the National Health Mission in 2005.

New name of the above program from 3rd May, 2023. Rename of NPCDCS as "**National Program for Prevention and Control of Noncommunicable Diseases (NP-NCD)**"

New diseases are included in the above program viz:

- Nonalcoholic fatty liver disease
- Chronic kidney disease
- Chronic obstructive pulmonary disease and asthma
- A gamut of other diseases

Q63a. Objectives of NPCDCS are:

Ans:
- Prevent and control common NCDs through behavior and lifestyle change
- Provide early diagnosis and management of common NCDs
- Build capacity at various levels of health care for prevention, diagnosis and treatment of common NCDs
- Train human resources within the public health setup, doctors, paramedics and nursing staff to cope with the increasing burden of NCDs
- Establish and develop capacity for palliative and rehabilitative care.

Q63b. The main strategies of the NPCDCS are as follows:

Ans:
- Health promotion through behavior change with involvement of community, civil society, community-based organizations, media, etc.
- Outreach camps are envisaged for opportunistic screening at all levels in the healthcare delivery system from subcenter and above for early detection of diabetes, hypertension and common cancers.
- Management of chronic noncommunicable diseases, especially cancer, diabetes, CVDs and stroke through early diagnosis, treatment and follow-up through setting up of NCD clinics.
- Build capacity at various levels of healthcare for prevention, early diagnosis, treatment, IEC/BCC, operational research and rehabilitation.
- Provide support for diagnosis and cost-effective treatment at primary, secondary and tertiary levels of healthcare.

- Provide support for development of database of NCDs through a robust surveillance system and to monitor NCD morbidity, mortality and risk factors.

Write cancer components under national program for prevention and control of cancer, diabetes, cardiovascular diseases and stroke [NPCDCS]. (WBUHS, 2016)

Ans: Cancer is an important public health program in India, nearly 10 lakh new cases occurring every year and at a point of time, it is estimated 2.8 million cases. Cancer control program was launched 1975–76 and it was further revised 1984–85 and 2004 due to gaps in cancer treatment facilities. Ultimately in 2010, it was integrated with national program on prevention and control of cancer, diabetes, cardiovascular diseases and stroke.

The objectives of NPCDCS are:

- **Primary prevention** by health education
- **Secondary prevention:** Early detection and diagnosis of common cancer of cervix, mouth, breast and tobacco related cancer by screening and self-examination
- **Tertiary prevention:** Strengthening of the existing institutions of comprehensive therapy including palliative therapy.

Cancer services under NPCDCS are as follows:

- Common diagnostic services, basic surgery, chemotherapy and palliative care for cancer cases is being made available at 100 district hospitals.
- Each district is being supported with ₹ 1.66 crores per annum for the following:
  - Chemotherapy drugs are provided for 100 patients at each district hospital.
  - Daycare chemotherapy facilities are being established at 100 district hospitals.
  - Facility for laboratory investigation including mammography is being provided at 100 district hospitals.
- Home-based palliative care is being provided for chronic, debilitating and progressive cancer patient at 100 districts.
- Support is being provided for contractual manpower through one medical oncologist, one cytopathologist, one cytology technician, two nurses for daycare.
- State cancer institutes (SCI) will provide comprehensive cancer diagnosis, treatment and care services. SCI is an apex institute in the state for cancer treatment activities.
- Forty-five centers were to be strengthened as tertiary cancer centers (TCCs) to provide comprehensive cancer care services at a cost of 6.00 crores each during 2011–12.

Overview of NP-NCD:

- Management of noncommunicable diseases in primary healthcare:
  - It is important to note that patients with NCDs should be provided with standard management protocol to prevent complications.
  - There is no difference in the management of uncomplicated hypertension or diabetes whether in the tertiary hospital or primary health centers or other set up as long as standard guidelines are followed.
- Barriers for delivering NCD services in primary healthcare settings:
  - All major health programs in India and other developing countries have focused on maternal and child health services and infectious diseases. Not much emphasis was given to NCDs.
  - A common perception is that the management of NCDs requires super-specialists and high-end technology for diagnosis and treatment. The delivery of NCD services in primary healthcare facility not established.
  - Skills needed for delivery of all NCD interventions are too complex to be learnt by primary care workforce.
  - NCDs are chronic diseases which require ongoing monitoring and lifelong adherence to treatment. The goal of NCD care is not generally cure.
  - NCDs are not a priority issue that our country needs to address at primary care level.

- Organizing NCD services in primary healthcare settings:
  - NCD management services in a primary care level consist of screening activities and diagnostic services
  - Opportunistic screening is recommended
  - All patients diagnosed with HT, DM, COPD and asthma needs to be managed as per standard protocols.
- Patient flow pathway:
  - Screening of adult above 40 years patients
  - Each patient provided with unique ID number to avoid duplication
  - Record of weight, height, BP, Blood sugar recorded in the treatment card
  - All patients should be counseled on lifestyle changes, treatment compliance and regular follow-up
- Plan for patient follow-up:
  - Patients must be informed to come for regular follow-up.
  - Once a patient diagnosed can collect medicine for PHC
  - Six monthly or annual check ups can be done in a CHC or district hospital.
- Essential requirements NCD service delivery in primary healthcare settings:
  - Adequate manpower, e.g., trained health worker, nurse, pharmacist, counselor and MO
  - Availability of standard protocol
  - Availability of essential drugs and technologies
  - Established a good referral system
  - Establish a good data recording and reporting system
- Integration with other health program:
  An integration of NCD control interventions with other health program like TB, HIV, MCH and also oral health.
  - Data recording and reporting system
  - Monitoring of NCD program

Q63. Discuss the role of diet in the management of diabetes. *(ABKUB, 2019)*

Ans: Important role of diet in management of diabetes are discussed in Q39 and Q43.

Explain the role of diet in various diseases. Add a note on "Diet and Cancer".

(BNMUB, 2018; BGUHS, 2021)

Ans: Diet and nutrition are important factors in promotion and maintenance of good health throughout the entire life. It is established fact that the role of diet act as important determinants of chronic disease.

Role of diet in causation of disease: Food and nutrition (diet) acts as agent, host and environmental factors in the epidemiology of health and disease.

A. **Diet as agent factor:**
- If diet deficient in specific nutrient leads to deficiency disorder, e.g., vegetable diet can cause deficiency of vitamin B_{12}, fluoride deficiency in water may leads to dental caries
- Excess, e.g., diet rich in vitamin A causing hypervitaminosis A, dental fluorosis due to excess fluoride in water
- *Risk factor:* Diet rich in salt is a risk for hypertension

B. **Diet and host factor:** Disease like measles are common in children with PEM

C. **Diet as environmental factor:**
- *As vector:* Food as a vector for food borne diseases, for examples, cholera, amoebiasis
- *Food toxicant:* Diet rich in some type of toxic substance, for example, Khesari dal rich in BOAA causes lathyrism
- *Artificial content:* Poisons or toxins used for food preservation, processing causes diseases, for example DDT, BHC used in agriculture can enter food chain

- *Customs and traditions:* Numerous customs or traditional diets can result in diseases, for example, polished diet may cause beriberi due to deficiency of vitamin B_1 (thiamine)

Diet and cancer:

A. **Dietary fat:**
- A positive correlation exists between high fat diet and incidence of breast cancer
- Reduction of dietary fat may alter the risk of breast cancer by increasing the production of estrogen and release of prolactin
- High fat intake is suspected to be associated with cancer of colon
- Dietary fat increases the secretion of bile acids into bowel which then metabolized by bacterial flora into carcinogens and co-carcinogens.

B. **Dietary fibers:**
- Incidence of colon cancer is inversely related to dietary fibers
- Dietary fibers protect against intestinal carcinogens or precursors by dilatation or other effects

C. **Micronutrients:**
- Deficiency of vitamin A is associated with cancer of lung and other sites
- Deficiency of vitamin C is related to risk of stomach cancer because Vitamin C inhibits formation of carcinogenic nitrosamines in stomach

D. **Food additives and contaminants:**
- Artificial colors, preservatives, artificial sweeteners, pesticides, flavors may possibly have carcinogenic influence causing oxidation, polymerization leading to production of nitrosamines, polycyclic aromatic hydrocarbons which may be carcinogenic.
- Nitrosamines produced during food processing is responsible for certain types of gastric carcinoma
- Saccharin are associated with bladder cancer (in animal)
- Aflatoxin developed in stored food is a hepatic carcinogen

E. **Dietary habit:**
- Consumption of beef is associated with colon cancer
- Smoked fish is associated with stomach cancer
- Coffee intake is associated with bladder cancer and pancreatic cancer

F. **Alcohol:**
- Drinking excess amount of alcohol associated with risk of hepatic and esophageal cancer
- Beer drinking is associated with cancer rectum

Q66. What is tobacco control legislation in India? *(BNMUB, 2014)*

Ans: In confirmation of Parliament of India, tobacco control was notified and enforced on 18th May 2003. This is "The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003" (34 of 2003) and that is applied to whole India. Section 3 defines the ban on tobacco products, smoking in "public places". Advertisement includes any visible representation by way of notice, circular, level, wrapper or other document and also includes any announcement made orally or by any means of producing or transmitting light, sound, smoke or gas. Public place means any place to which the public have access, whether as of right or not, and includes auditorium, hospital buildings, railways waiting room, amusement centers, restaurant, public offices, court buildings, educational institutions, libraries, public conveyances. Restaurants or hotels are included which have more than thirty rooms or seating capacity of thirty persons or more should have a separate provision for smoking area or space. Tobacco products and production mean cigarettes, cigars, cheroots, bidis, pipe tobacco, hookah tobacco, chewing tobacco, snuff. Pan masala or any other chewing materials having tobacco, gutka and tooth powder containing tobacco. **Warning signs and levels** should be prominent or as prescribed by rules and in English or any other Indian language.

Punishment for smoking in public places is a fine of ₹ 200.00 that is compoundable. Punishment for advertisement of cigarettes and tobacco products for the first time is 2 years imprisonment or with fine up

to ₹ 1,000 or with both and second or subsequent conviction imprisonment may go up to 5 years and fine up to ₹ 5,000. Punishment for sale of cigarette or any other tobacco products in certain places or to persons below 18 years is up to ₹ 200/- and all offences are compoundable.

Q67. Explain passive smoking. *(RGUHS, 2014; SAMU, 2022)*

Ans: Passive smoking is inhalation of environmental tobacco smoke, the smoke exhaled by someone else or emitted by the tip of a burning cigarette. Adverse effect of passive smoking on health are as follows:

- **In children:**
  - Pneumonia and bronchitis
  - Coughing and wheezing
  - Worsening of asthma
  - Middle ear disease
  - Stunted growth
  - Allergies
- **In adult:**
  - Increased risk of cancer in general, lung cancer (20–30%)
  - Predisposition of cardiac disease
  - Diseases of upper and lower respiratory tracts and also exacerbation of asthma.
- **In pregnancy:**
  - Increased risk of miscarriage
  - Premature delivery
  - Low birth weight (LBW)
  - Sudden infant death syndrome (SIDS)

Preventive measure:

- **Health education:** Educating smokers about adverse effect of passive smoking in their friends and family and encouraging them to give up smoking especially when they have kids at home.
- **Legislation:** To prevent individuals from passive smoking. Government of India has banned smoking in public places.

BLINDNESS RELATED QUESTIONS AND ANSWERS

Q68a. Enlist major causes of blindness in India. Outline the strategies adopted for control of blindness under national program. *(WBUHS, 2008, 2011; GITAMAP, 2023; RGUHS, 2008, 2010, 2014; BNMUB, 2019; RUHH, 2021)*

Q68b. Many school students in your block are found suffering from reduced ability to see the board-work by the teacher in class room. As BMOH, how will you manage the situation? *(WBUHS, 2018, 2022; TRIU, 2021, 2024)*

Ans: Causes of blindness:

A. **Medical cause**

- Cataract
- Refractory error
- Posterior segment pathology (vitreous hemorrhage, diabetic retinopathy, etc.)
- Corneal opacity
- Surgical complications
- Posterior capsular opacity
- Miscellaneous (trachoma, malnutrition, ocular injury, etc.)

B. **Social cause**
- Illiteracy, ignorance
- Poverty
- Low standard of personal and community hygiene
- Inadequate health care services
- Lack of trained manpower

Block medical officer of health should undertake the measures.

He is the principal medical officer of the block under whose leadership general duty medical officers, public health nurses, health assistants, multipurpose health workers and different bands of voluntary workers employed under his/her supervision in the block.
- Situation analysis: Measuring the magnitude of the problems
- Identification of causes
- Assessment of resources

Following strategies are adopted under the national program for control of blindness:

A. **Cataract surgery by IOL implantation:** Cataract operations have substantially increased from 16 lakhs in 1992–1993 to 60.3 lakhs in 2010–11. Cataract surgery rate should be 400/100,000 population is required to enable states to clear backlog of cataract blindness.

Steps to control cataract blindness:
- Identify the blind and list them in village registers.
- Organize screening camps for confirming cataract blind to referral.
- Transport cataract blind to base hospital.
- Follow-up of operated cases, carrying out refraction and providing best corrective spectacles.

Target setting:
- Cataract surgery rate - Up to 600/100,000 population over 3 years.
- Gender - To ensure more than 50 percent beneficiaries as women.
- Social class - Minimum 40 percent of the target, belonging to SC/ST and minority group.
- Economic criteria - Block wise target to ensure equal coverage of all villages and 60 percent of the persons living below poverty line.

B. **School eye screening program:** 5–7% of children aged 10–14 years have problem with their eyesight affecting learning at school. Teachers have been trained to screen the children. Screening by paramedical ophthalmic assistant is done on annual basis. After confirmation by ophthalmic assistant, glasses are prescribed at free of cost to the poor.

C. **Eye donation:** Corneal blindness accounts for 1% of the cases of blindness. It mainly occurs among children and young adults. Common causes include vitamin A deficiency, eye infection, injury, etc. Donated eyes need to be removed within 6 hours of death of death of the individual. It is to be preserved in specific solution in eye banks and utilized for transplantation within 72 hours. Eye donation fortnight is organized from 25th August to 8th September every year to promote eye donation.

D. **Development of infrastructure:** For this purpose, construction of eye ward, OT, dark room in district hospital and its above level is necessary to improve the quality and coverage of services.

E. **Human resource development:** Imparting training to the eye surgeon in IOL surgery was taken up as an important input during 9th plan. Hundred faculty members of the medical college is trained as trainers. This was followed by training of district eye surgeons, training of nurses in ophthalmic technique, refresher training of ophthalmic assistants, training of PHC medical officers, health workers, teachers, link workers.

F. **IEC activities:** These activities are taken up at central, state and district level. Special campaign for mass awareness is taken up during eye donation fortnight (25th August to 8th September) and world site day (2nd Thursday of October). At the central level, prototype IEC material is produced and disseminated to the state.

G. **Support to voluntary organization:** Voluntary organization played an implementing [illegible] under the program. For expansion of eye care units in tribal and backward rural areas, a grant of ₹ 25 lakh is provided through state blindness control society.

H. **Decentralization to district level:** It took place largely through district blindness control [illegible] consisted of Chairman, Vice-Chairman, Technical Advisor and other members. It is a forum where government, nongovernment and private sectors are present together. They jointly plan, implement and monitor the blindness control activities in the district as per guideline of government of India.

Q69. Write definition of blindness according to WHO. Discuss in brief the three levels of eye care for prevention of blindness in our country. *(WBUHS, 2008; CMH, 2006)*

Ans: WHO proposed a uniform criterion and defined blindness as "visual acuity of less than 3/60 or its equivalent

Levels of eye care:

A. **Primary eye care:** A wide range of eye conditions can be treated/prevented at the grass root level by locally trained primary health care workers (village health guide, multipurpose health workers) who are first to make the contact with the community.

The condition includes the following:

- Acute conjunctivitis
- Ophthalmia neonatorum
- Superficial foreign bodies
- Xerophthalmia and so on.

For this purpose, they are provided with essential drugs and equipment such as topical tetracycline, vitamin A capsules, eye bandages, shields, etc. They are also trained to refer difficult cases to the nearest PHC or district hospital. Their activities also involve the following:

- Promotion of personal hygiene and sanitation
- Good dietary habit
- Health education, etc.

B. **Secondary eye care:** This care is provided at PHC, CHC and district hospitals. It involves definitive management of common blinding conditions as:

- Cataract
- Trichiasis
- Entropion
- Ocular trauma
- Glaucoma, etc.

The secondary care may involve the use of mobile eye clinics. The eye camp approach to make the cataract surgery available has been highly successful and has received wide popular support. Apart from cataract operation, these camps undertake general health surveys for the early detection of the visual defects as well as education of general masses. For effective mobile services, there must be good community participation in the program. The mobile units though valuable, lack of permanence and are being utilized as a comprehensive strategy for eye care.

C. **Tertiary care:** These services are established in the national or regional capitals and are often associated with medical colleges and Institute of medicine. They provide sophisticated eye care.

- Retinal detachment surgery
- Corneal grafting
- Laser radiation
- Correction of squint, etc.

The majority of states in India have passed the corneal grafting Acts which have helped the establishment of eye banks. Other measures of rehabilitation comprise education of the blind in special schools and utilization of their services in gainful employment. The central government has established National Institute for Blind in Dehradun to work out the new approaches and strategies for solving the problems of the blind.

Q70. Delineate the structure of operation for vision 2020: The right to sight in our country. *(WBUHS, 2018, 2021; SSUHSA, 2016; NU, 2017; SDVPG, 2023)*

Ans: **Vision 2020:** It is a global initiative to reduce avoidable blindness by 2020. India also committed to this initiative. India is also committed to this initiative.

Main feature of the plan of action for the country are as follows:

- **Target disease**: Cataract, refractory error, childhood blindness, corneal blindness, glaucoma, and diabetic retinopathy.
- **Human resource development as well as infrastructure and technology development**:

The proposed four tier structure includes Centers of excellence **(20),** training centers **(200),** service centers **(2000)** and vision centers **(20,000)**.

Universal eye health: Global action plan: 2014–2019

WHO estimates in 2010, there were 285 million people were visually impaired of which 39 million were blind. If we consider the two major causes of visual impairment as priorities, accordingly control measure were implemented by providing refractive services and offering cataract surgery to the people in need, two-thirds of the visually impaired people could recover good eye.

Control measures:

- Provision of effective and accessible eye care services by strengthening and integration of eye care services through primary health care. Almost all causes of visual impairment are avoidable, e.g., diabetes mellitus, smoking, premature death, rubella, vitamin A deficiency, etc. Again visual impairment is frequent among older age groups.
- Improvements of maternal, child and reproductive healthcare are important.
- Provision of safe drinking water and basic sanitation
- Eye health should be included in the frameworks of communicable and noncommunicable diseases
- It should address the aged populations

Three indictors are used measure the progress at national level:

1. Reduction of prevalence of avoidable visual impairment by 25% by 2019. From the baseline of 2010.
2. Number of eye care personal
3. Cataract surgical service delivery:
   - Cataract surgical rate (number of surgeries performed per million population)
   - Cataract surgical coverage (number of individuals with bilateral cataract causing visual impairment, who have received cataract surgery on one or both eyes)

Q71. What is preventive blindness? *(WBUHS, 2014; RGUHS, 2008; TDMGRMU, 2008, 2011)*/**Majority of blindness can be prevented-explain.** *(WBUHS, 2017, 2023; SAMU, 2022; MGUB, 2023, 2024; RGUHS, 2024)*

Ans: The concept of avoidable blindness (i.e., preventable or curable blindness) has focused in recent years. Many causes of blindness are preventable by improving nutrition, by treating cases of infectious diseases, by infection control or by improving safety conditions particularly on roads, at work or in the home.

National program for prevention of blindness comprises the following:

- **Initial assessment:** Assessment of magnitude, geographical distribution and causes of blindness within the country through prevalence surveys. This important for setting objectives and priorities and subsequent development of intervention strategies.
- Methods of intervention.

(Primary, secondary and tertiary care – already discussed in the long essay question 68)

ACCIDENT-RELATED QUESTIONS AND ANSWERS

Q72. Describe the epidemiology of Road Traffic Accident (RTA) in India. Common causes of RTA, describe the measures you would take as BMOH to reduce the problem where BPHC is situated by the side of a busy highway and accidents are common. *(WBUHS, 2009, 2019; SMU, 2006; TDMGRMU, 2014; RGUHS, 2012, 2024; ABKUB, 2018; TRHU, 2024)*

Ans: WHO advisory group in 1956 defined accident as an **"Accident is an unpremeditated event resulting in recognizable damage".**

Epidemiological factors

A. **Agent factors:**
- *Type of vehicle:* Accidents are more common with 2 wheelers because they are unstable and provide less protection to their riders.
- *Speed of vehicle:* Over speed increases risk of accident in many folds
- *Maintenance of vehicle:* Poor maintenance may cause accident

B. **Host factors (human factors):**
- *Age:* Accidents are higher in age group of 15–34 years
- *Gender:* Road accidents are common in males
- *Pedestrians:* Pedestrians are more affected than riders
- *Medical condition:* Epilepsy, vertigo, refractive errors contribute to accidents
- *Habits:* Smoking, alcoholism talking on phone during driving may cause accident
- *Psychological factors:* These include delayed judgment, faulty perception, mental condition at the time of accident.

Ba. **Human factor is more important than environmental factors in causing accident** *(WBUHS, 2024)*
Human factor is more important than environmental factor in causing accident because in up to 90% of cases human failure is the cause. Human factors may be physical, e.g., diminished acuity of vision, impaired hearing. Physiological factors are sex, age, time of occurrence of accident. Psychological factors are carelessness, overconfidence and emotional stress.

C. **Environmental factors:**
- *Relating to road:*
  - Accidents are more common in urban areas
  - Defective narrow road, curve and slippery road conditions
  - Presence of cross road, poor signaling and poor lighting
- *Relating to vehicles:* Overloading
- *Season:* More common in rainy season than winter due to fog and poor weather
- *Mixed traffic:* Pedestrians and animals get into the road
- *Legislation:*
  - Ignorance about rules
  - Lax in implementation of traffic rules
  - Fraudulent issue in driving licenses

Causes of RTA:

Psychosocial:
- Lack of experience
- Risk taking behavior
- Impulsiveness
- Defective judgment
- Aggressiveness
- Poor perception
- Family dysfunction
- Lack of body protection—Not wearing helmet, safety belts, etc.

Causes related to road:
- Defective narrow roads
- Defective layout of crossroads
- Poor lighting

Causes related to vehicles:
- Excessive speed
- Old poorly maintained vehicles
- Large number of 2–3 wheelers
- Overloaded bus
- Bad weather condition

Medical condition:
- Sudden illness
- Impaired vision
- Lack of hearing acuity, etc.

Prevention and control:
- **Use of seat belts:**
  - Use seat belts prevent approximately 50% of fatal injuries
  - There use is mandatory in major cities of India
- **Safety helmets:** Use of helmets reduces the risk of head injuries and its use is mandatory as per motor vehicle act.
- **Leather clothing and boots:** Its use reduces the risk of extensive superficial soft tissue injury.
- **Use of headlights:** It is used in day to enhanced visibility thus reduces the chance of accidents.
- **Drinking and driving:** Restricted during driving
- **Mobile phones:** Prohibited during diving
- **Pneumatic bus doors:** May be the cause of accident.

BMOH should undertake the measures.

He is the principal medical officer of the block under whose leadership general duty medical officers, public health nurses, health assistants, multipurpose health workers and different bands of voluntary workers perform in the block for medical and health causes. BMOH is simultaneously a doctor, administrator, manager, communicator, teacher, etc., and leader for all activities. Under his leadership with required band of staff, they will manage the situation of problem if any.

Common problem like road traffic accidents can be controlled and managed in the following line of actions.

Situation analysis:
- **Measuring the magnitude of problem:** It can be measured from hospital records or other relevant records. Different indicators related to accident are calculated.
- **Identification of causes:** Causes of accidents should be investigated thoroughly.
- **Assessment of resources:** Following resources are essential for controlling the situation
  - *Manpower:* Doctors, nurses, BPHN, PHN, health supervisors, district police officers, etc.
  - *Materials:* Vehicles, suture material, IV fluids, necessary drugs and equipment, health education materials, etc.
  - *Money:* It is required for implementation of different control measures.

Implementation:

Management of existing cases: It should begin at accident site, continued during transportation and concludes in hospital emergency room. At any of the stages, life may be saved or not depending upon the skills of the healthcare worker, availability of needed emergency equipment, etc., necessary dressing and suturing of affected cases should be done, if necessary, TT is given, IV fluids are administered. If blood storage unit is available, blood should be transfused those who need it. Prompt referral of

complicated and difficult cases should be done in subdivision hospital/district hospital/medical colleges.

Health education/IEC:

- **Target group:** Adult male and female, adolescents, panchayat leaders, community leaders, NGO people etc.
- **Training of different categories of staff:** Staff should be trained in different aspects of accident prevention and control to improve the quality of services should be undertaken.
- **Intersectoral coordination:** In spite of the best effort of health sectors, accident prevention and control requires support from other sectors also.
- **Coordination with public health engineering department:** Improvement of road condition, marking danger points, improvement of lighting, imposition of speed limits, etc., are essential to control and reduce accidents.
- **Coordination with police, law and motor vehicles department:** It is required for the following issues:
  - Driving tests
  - Enforcement of speed limit
  - Compulsory wearing of seat belt and crash helmets
  - Checking of blood alcohol concentration
  - Roadside breath testing for alcohol
  - Regular inspection of vehicle
  - Periodic re-examination of drivers
- **Community participation:** Local community members can participate in following issues:
  - Rescue of the affected patients
  - Maintaining good road condition
  - Arranging health education campaign

BMOH should implement the above mentioned strategies following level of healthcare delivery system and using different categories of manpower.

Q73. Explain domestic accidents with its causes. *(RGUHS, 2014; SAMU, 2013; TDMGRMU, 2009, 2012)*

Ans: Domestic accidents are the accidents occurring in and around the houses and in general, all accidents are not related to traffic, vehicles and sport.

Classification:

- **Burns:**
  - It may be by hot liquids, flames, electricity, crackers, chemicals, etc.
  - Risk factors are explosion of pressure stoves, cooking on open fires, instability of small stoves, use of open fire during winter for warmth and use of inflammable materials in housing and furnishing
  - It is more amongst women due to dowry menace
- **Drowning:**
  - It can take place in ponds, rivers and oceans or during floods and cyclones
  - It is common amongst children
- **Poisoning:**
  - It is often caused by pesticides, kerosene oil, drugs and house hold chemicals
  - It is seen in all age groups but accidental poisoning is more common in children
- **Falls:**
  - Occurs during picking fruits from trees like coconut, construction work and children flying from upper roof while flying kites, etc.
  - It is common in children and young adults
- **Injuries:** Can occur from falls, hitting with sharp or blunt objects and also from animal bites (e.g., dog

Prevention:

- **Primary prevention:**
  - Elimination of causative factors
  - Safe storage of drugs, poisons, weapons
  - Strong poisons outside home and kept in above children's head height
  - Introduction and enforcement of legislation to prohibit the sale of poisons in second hand containers
  - Separating cooking areas from living areas
  - Efforts to reduce use of indoor fires of cooking, ensuring that cooking surfaces are at heights, reducing the storage of inflammable substances in households and supervising young children more effectively
  - Fencing domestic swimming pools, covering wells with grills, fencing nearby lakes or riverbanks, etc.
  - Fencing of water bodies like well, ponds, etc.
  - Provision of fire safety equipment
  - Use caution especially for children
- **Secondary prevention:**
  - Provision of accessible primary care
  - Education of public about first aid in case of domestic accidents
- **Tertiary prevention:**
  - Rehabilitation of injured person to prevent, reduce or compensate disability.
  - Rehabilitation can be medical, social and occupational, etc.

SNAKE BITE-RELATED QUESTIONS AND ANSWERS

Q74. Explain snake bite its epidemiology, risk factors, early clues for patients, first aids, and antivenom.

Ans: Snake bite is a neglected public health issues in many tropical and sub-tropical countries. About 5.4 million snake bites occurs each year resulting in up to 2.7 million envenoming (poisoning from snakebites) at least 81,000–138,000 deaths and around 3 times amputation and other permanent disabilities. Most of the case occur in Africa, Asia and Latin America. In Africa alone there are an estimated 1 million snakebites annually with about half needing treatment. This type of injury is often found among women, children and farmers in poor rural communities in low, and middle-income countries.

The outcome of snake bites depends on numerous factors such as:

- Species of snake
- The area of body bitten
- The amount of venom injected
- Health condition of the victim

Clinical features of snakebite:

- Feelings of terror and panic are common after a snake bite and can produce a characteristic set of symptoms mediated by autonomic nervous system like tachycardia, nausea
- Bites from nonvenomous snakes may cause injury, laceration caused by snakes' teeth or from infection
- A bite may trigger an anaphylactic reaction, which is potentially fatal
- The venom of poisonous snakes may be predominantly neurotoxic or cytotoxic. Neurotoxins may cause, ptosis, dysphagia, diplopia and respiratory failure
- Cytotoxic venoms may cause tissue destruction by digestion and hemorrhage due to hemolysis and destruction of endothelial lining of the blood vessels
- The manifestation of rattlesnake envenomation are mostly local pain, redness, swelling and extravasation of blood, perioral tingling, metallic teste, nausea, vomiting, hypotension and coagulopathy may also occur.

- Almost all vipers cause necrosis of muscle tissue and die subsequently resulting accumulation of [illegible] in the renal tubules which leads to acute renal failure.

Early manifestations / clues that a patient has severe envenoming:

- Snake identified as a very dangerous one
- Rapid early extension of local swelling from the site of the bite
- Early tender enlargement of local lymph nodes indicate the spread of venom in the lymphatic [illegible]
- Early systemic symptoms like collapse (hypotension, shock), nausea, vomiting, diarrhea, severe [illegible], heaviness of the eyelids, drowsiness, early ptosis and ophthalmoplegia
- Early spontaneous systemic bleeding
- Passage of dark/black urine

First aid: The government of India developed a national protocol in 2007, which includes:

- Reassure the patient as 70% of all snake bites are from nonvenomous species. Only 50% of bites by venomous species actually envenomate the patient.
- Immobilize in the same way as a fractured limb. Use bandages or cloth to hold the splints, do not [illegible] the blood supply or apply pressure. Do not apply any compression in the form of ligatures, they do [illegible] work and can be dangerous.
- Do not give alcoholic beverages or stimulant. They are known vasodilators and they speed up the absorption of venom.
- Remove any items or clothings, which may constrict the bitten limb if swells (rings, bracelets, watches etc.)
- Do not incise or manipulate the bitten site; do not apply ice
- Transport the patient to a medical faculty for definitive treatment.

Antivenom:

- The first antivenom was developed in 1895 by French physician Albert Calmette for treatment of Indian cobra bites. Antivenom is made by injecting a small amount of venom into an animal, usually a horse or sheep) to initiate an immune response afterwards antibodies are then harvested from the animal's blood.
- Modern antivenoms are usually polyvalent, making them effective against the venom of numerous snake species.
- Despite huge advances in emergency therapy, antivenom is still the only the effective treatment of envenomation.
- Antivenom is injected intravenously and work by binding to and neutralizing venom enzymes.
- It should be started as early as possible it has no action on the damage already caused by venom.
- Pharmaceutical companies produce it for particular area as per the species available there.
- Some people may develop anaphylaxis due to antivenom which is treatable.

Important issues in relation to snakebite:

- Most of the snakebite fatalities are due to not seeking modern medical treatment, delay in reaching the hospitals, erratic pressure and inadequate training of attending doctors and insufficient storage of medicine. Studies have shown that doctors at primary health care level hesitate to treat snakebites mainly due to lack of confidence. At secondary and tertiary care level, management protocol based on textbooks published from western countries, not appropriate for Indian settings is being forward ignoring the national therapeutic guidelines. Moreover, in different healthcare institutions AVS is often not administered judiciously.
- Finally, to overcome this unpleasant situation of snakebite mortality some attempts to be made in the health sectors in our country like early initiation of modern medical treatment, healthcare providers at all levels including local faith healers needs training in management of snakebite cases as per existing government guidelines according to their capacity with requisite logistics.

Integrated disease surveillance program (IDSP).

Integrated disease surveillance program. *(RHHI, 2021)*

Ans: It was launched as pilot project in 1997 in 5 districts. Afterwards, government of India launched integrated disease surveillance project in 2004 with the assistance from World Bank. The project intended to cover all states in a phased manner. IDSP is proposed to continue as integrated disease surveillance and response program under NRHM with domestic budget in 12th plan and beyond.

Project objectives:

A. To establish a decentralized district-based system of surveillance for communicable and noncommunicable diseases for initiation of timely and effective public health action to tackle health challenges in the country in urban and rural areas.

B. To integrate surveillance activities of various health program and share information across all disease control program and stakeholders, so that valid data are available for decision making at district, state and national levels.

Specific objectives:

- To integrate all existing surveillance activities of national disease control/eradication program at district level
- To establish system of data collection, collation, compilation, analysis and feedback by using information technology
- To improve laboratory support for disease surveillance
- To develop human resources for disease surveillance and action as a rapid response teams
- To involve all stakeholders including private sectors

Project activities:

- Upgradation of laboratories
- Upgradation of information technology and communication
- Training of all level of staff
- Operational activities and response
- Monitoring and evaluation

Data management: Data on epidemic prone disease is collected under IDSP on a weekly basis on prescribed formats from different reporting units. Broadly, there are three types of surveillance under IDSP.

- S (Suspected cases) for syndromic surveillance to be reported by health worker, village volunteers or nonformal practitioners.
- P (Presumptive cases) for presumptive surveillance reported by medical officer.
- L (Laboratory confirmed cases) for laboratory surveillance.

The reporting units under IDSP for specific form are **(Table 8.2)**:

- **S Form:** Sub-center
- **P Form:** PHC, CHC, other government hospitals and identified private hospitals
- **L Form:** PHC labs, district public health labs, other government hospital labs, referral labs and identified private hospital labs

Laboratory components: Laboratories also provide weekly data on the total number of samples tested and no samples found positive. The laboratory form has 12 specific diseases and provision for reporting of any other disease.

In May 2017, IDSP conducted a workshop to develop the minimum data set for diseases and health conditions under IDSP. At the request of MoHFW/GOI and WHO country office supported the development and design of the integrated health information platform (IHIP).

On 5th April 2021, government of India officially launched **"Integrated Health Information Platform**, the revised next generation integrated disease surveillance program".

Table 8.2: List of diseases under surveillance.

Diseases under presumptive (P form)	*Diseases under confirmed (L form)*
Acute diarrheal disease (including acute gastroenteritis)	Dengue/DHF/DSS
Bacillary dysentery	Chikungunya
Viral hepatitis	Japanese encephalitis
Enteric fever	Meningococcal meningitis
Malaria	Typhoid fever
Dengue/DHF/DSS	Diphtheria
Chikungunya	Cholera
Acute encephalitis syndrome	Shigella dysentery
Meningitis	Viral hepatitis A
Measles	Viral hepatitis E
Diphtheria	Leptospirosis
Pertussis	Malaria–*Plasmodium vivax* and *Plasmodium falciparum*
Chickenpox	
Fever of unknown origin	
Acute respiratory infection (ARI)/influenza like illness	
Pneumonia	
Leptospirosis	
Acute flaccid paralysis <15 years of age	
Dog bite	
Snakebite	
Any other state specific disease (specify)	
Unusual syndromes not captured above (specify clinical diagnosis)	

CM8.6: Educate and train health workers in disease surveillance, control and treatment and health education.

All primary healthcare workers are usually in contact with the community. Health workers identify syndromes and ensure prevention and control measures. Their training and continuing education is very vital.

Health workers and supervisors have been trained under integrated diseases surveillance program. Two days induction training of male and female health workers and supervisors was conducted at CHC level by trained medical officers with the support of district surveillance officer.

Contents of training program:

- Overview and introduction of surveillance syndrome description
- Filling up the form for data collection and compilation
- Analysis and interpretation of data for local action
- Early detection of usual events
- Collection of specimens
- Reporting these events to medical officers/supervisors
- Biosafety issue
- Basic response to outbreaks at local level

Sub-center, PHC, CHC in rural areas and urban health center and hospitals in urban areas are the reporting units under IDSP. Target diseases mainly communicable diseases. Health worker, volunteers are collecting information on syndromic surveillance. Health workers identify cases based on presenting symptoms such as fever less than 7 days/more than 7 days, cough more than 2 weeks with/out fever, loose watery stools of less

than 14 days, jaundice less than 4 weeks, acute flaccid paralysis less than 15 years of age and others unusual symptoms. Workers submit weekly report on every **Monday on S-Form** to the respective supervisors/MOs. The supervisors/MOs are responsible for continuing medical education and providing feedback to the workers/units on the data quality, its accuracy, completeness and timeliness.

Subsequently, health workers have been made responsible to provide treatment of some diseases like diarrhea, ARIs, fever, early detection of diseases under IDSP, so as to prevent outbreaks, other supportive measures like immunization, chlorination, vector control, regular home visits, mother meetings in village health and nutrition day (VHND) at Anganwadi center (AWCs).

As per National Health Policy 2017, paradigm is shifted from **selective primary health care to assured comprehensive primary healthcare** through upgradation of sub-centers to **health and wellness centers**.

Health workers and their supervisors and ASHAs were given in-services modular training for the duration of 3-5 days at community health centers on noncommunicable diseases (NCDs). On the job training and support is being provided by MOs of PHC and supervisors. As control of CCDs, NCDs, RCH and FP and nutrition problems have been delegated to sub-centers workers (ANMs, supervisors, ASHAs) and they have to be supported by trainers for expected outcomes. Health and wellness centers are now providing services for NCDs like screening of hypertension, diabetes, obesity along with 3 common cancers (cervical, breast and oral). These upgraded centers are providing integrated services like RCH, FP, CCDs and NCDs, etc., free of cost and also these centers are equipped with essential medicines for NCDs and other necessary logistics.

Health education for behavior change: The health and wellness centers are taking initiatives for effective communication by camp approach, interpersonal communication, posters and banners to educate people in the community, households, schools, Anganwadis and their catchment areas.

Key messages are:

- Consumption of health foods
- Increase physical activity
- Avoid tobacco and alcohol
- Warning signals of common cancers

They submit regular reports on NCDs every month.

Q8.7: Describe the principles of management of information systems.

Health management information system **(HMIS)** is defined as a system that provides up-to-date, reliable complete and timely information to health managers at various levels. It is an important tool which supports the managers to make decisions for policy formulation and interventions. Most of the information reaches the program managers in the form of routine reports which are generally standardized in format and produced on a regular basis. It is a systematic way of collecting, reporting and using data at all program levels.

Raw data becomes information when it is analyzed, processed and interpreted. The timely information thus generated is used for action and decision-making at all the levels of management like home-based or clients-based records and information—village-based—sub-center—PHC—CHC—district—state and national level.

A formal system of reporting has been established in health system.

Delivery monthly progress report from the lowest level, i.e., sub-center is processed and transmitted to higher level, i.e., PHC—CHC—district—state - central government.

HMIS captures facility-wise information of 400 elements of service delivery every month, training data on quarterly basis and infrastructure and HR data on annual basis covers 700 elements. At present, 2.1 lakh health facilities are uploading their healthcare services delivery data.

Uses of HMIS:

- To support decision-making and action taking
- To assess community health needs
- To assess the performance of health workers or institution like sub-center, PHC, CHC, district and state
- To monitor program operations and gap analysis

- To evaluate program
- To measure its success and failure
- For better planning and implementation of services

Users of HMIS: Local level workers use HMIS data specially birth rate to formulate a magic figure of antenatal mothers, infants and eligible couples, etc., in a sub-center level. If the HMIS is operational the health workers can plan the services at local level and also sharing the information with local community. HMIS in health system are described through the following **(Fig. 8.5)**:

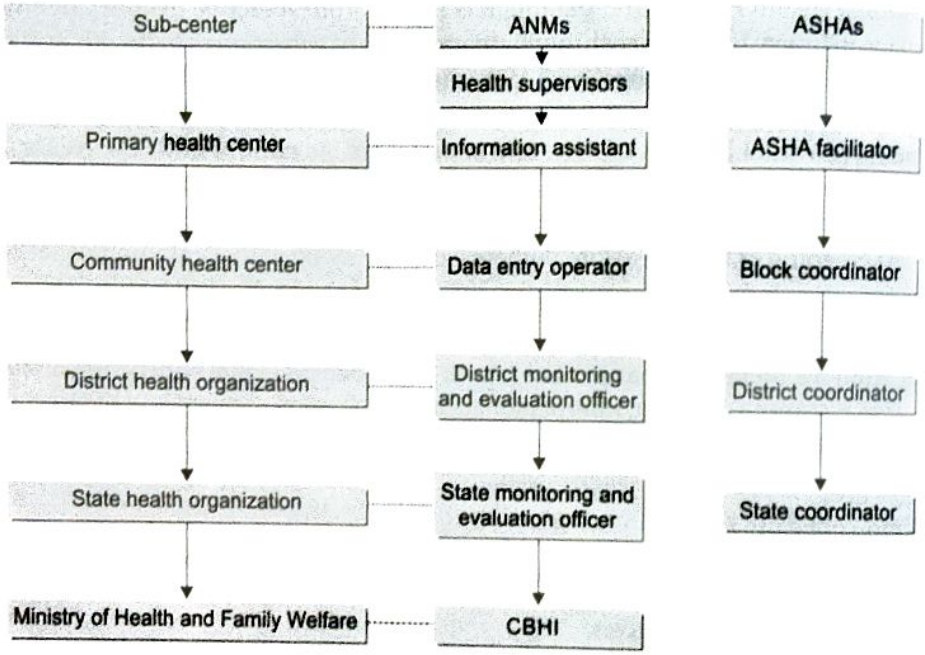


Fig. 8.5: HMIS.

MULTIPLE CHOICE QUESTIONS (MCQS)

COMMUNICABLE DISEASES:

1. **India was declared smallpox free in:** *(BNMUB, 2005; SSUHSA, 2020)*
   a. 1920 b. 1977 c. 1978 d. 1979
2. **The world has declared free of smallpox is:** *(ABKUB, 2019)*
   a. 1973 b. 1976 c. 1980 d. 1984
3. **Which of the following is true of chickenpox?** *(VKSUAB, 2020)*
   a. Virus not found in scalp
   b. Virus can be grown on the chick embryo
   c. Caused by RNA virus
   d. Does not cross the placental barrier
4. **Infectivity of chickenpox last for:** *(ABKUB, 2015; RUHH, 2020)*
   a. Till the last scab falls of
   b. For six days after onset of rash
   c. For three days after onset of rash
   d. Till the fever subsides
5. **Secondary attack rate of chickenpox is:**
   a. 40% b. 50% c. 60% d. 90%
6. **Koplik's spots are diagnostic sign of one of the following diseases:** *(ABKUB, 2020)*
   a. Rubella b. Whooping cough c. Measles d. Meningitis

Koplik's spots are seen in:
a. Eruptive stage of measles
b. Eruptive stage of chickenpox
c. Prodromal stage of measles
d. Carrier stage of Diphtheria
(BNMUB, 2002)

Incubation period of leprosy is:
a. Few days to months b. Few months to years c. 2 to 5 years d. None of the above
(YSRUHSAP, 2023)

Ulcer of hands in a leprosy patient is an example of:
a. Primary disability b. Secondary disability c. Tertiary disability d. Quarterly disability
(BNMUB, 2006)

The bacterial index of leprosy helps to:
a. Assess the success of the treatment
b. Assess the bacterial load of the disease
c. Assess when the patient will not respond to treatment
d. Assess the failure of interpretation test
(SAMU, 2016)

All of the following statements about leprosy are true, *except*:
a. Multi-bacillary leprosy is diagnosed when there are more than 5 skin patches
b. New case detection is an indicator for incidence of leprosy
c. A defaulter is defined as a patient who has not taken treatment for 6 months or more
d. The target for elimination of leprosy is to reduce the prevalence to less than 1 per 10,000
(ABKUB, 2002)

Incubation period of poliomyelitis is:
a. 1 to 4 days b. 7 to 14 days c. 2 to 3 months d. None of the above
(SAMU, 2016)

A case of acute flaccid paralysis should be kept under surveillance for residual paralysis:
a. 30 days b. 45 days c. 60 days d. 90 days
(ABKUB, 2020)

Regarding clinical spectrum of poliomyelitis, approximately one percent of all polio infections are:
a. Abortive polio b. Inapparent polio c. Nonparalytic polio d. Paralytic polio
(ABKUB, 2017)

The commonest mode of transmission of AIDS in India (in descending order) is:
a. Transplacental, homosexual, hetarosexual
b. Homosexual, hetarosexual, transplacental
c. Heterosexual, transplacental, homosexual
d. Heterosexual, homosexual, transplacental
(YSRUHSAP, 2023)

Prepacked color coded sexually transmitted infection/reproductive tract infection kits for inguinal bubo is:
a. Green b. Grey c. Red d. Black
(ABKUB, 2016; TRIU, 2023)

The window period of HIV infection is:
a. 3-12 weeks b. 8–20 weeks c. 6–24 weeks d. None
(ABKUB, 2016; VKSUAB 2021)

Cluster testing is useful in detecting cases of:
a. Measles b. Diabetes mellitus c. Cancer d. STD
(ABKUB, 2021)

Among STI/RTI color coded kits, kit 1 (grey) is for:
a. Vaginitis b. Urethral discharge c. Genital ulcer d. Lower abdominal pain
(AKUB, 2022)

Lymphogranuloma venereum is caused by:
a. *Treponema pallidum* b. *H. ducreyi* c. Chlamydia d. None of them
(ABKUB, 2016; RUJH, 2023)

The most appropriate test to assess the prevalence of tuberculosis infection in a community is:
a. Sputum examination
b. Mass miniature radiology
c. Tuberculin test
d. Clinical examination

22. What is goal of National Tuberculosis Elimination Program in India?
a. Eliminating the disease by 2025 b. Eliminating the disease by 2027
c. Eliminating the disease by 2030 d. Eliminating the disease by 2035

23. Antitubercular drug contraindicated in pregnancy is: *(KIMS, 2018,*
a. INH b. Rifampicin c. Streptomycin d. Pyrazinamide

24. Which is not a second line of anti-TB drug?
a. Amikacin b. Linezolid c. Clofazimine d. Streptomycin

25. NTEP recommends which of the following sputum sample examinations for the diagnosis of PTB?
a. One sputum sample b. Two sputum sample
c. Three sputum sample d. Sputum examination is not recommended

26. Antigenic shift and drift occurs in:
a. Measles b. Mumps c. Influenza d. Rubella

27. All of the following are zoonoses, *except*: *(ABKUB, 2016,*
a. Plague b. Brucellosis c. Japanese encephalitis d. Tuberculosis

28. All the following diseases are transmissible by contact with soil, *except*:
a. Ancylostomiasis b. Leptospirosis d. Anthrax d. Leishmaniasis
e. HIV

29. The characteristic features of rabies include all, *except*:
a. Can manifest as ascending paralysis b. Hematogenous spread to brain
c. Can be transmitted by bites, other than dogs also d. Is invariable fatal

30. The Negri bodies are seen in:
a. Viral hepatitis b. Japanese encephalitis b. Poliomyelitis d. Rabies

31. Ten cases of food poisoning had been reported in hospital, 2 out of these developed mild gastrointestinal symptoms, 4 developed moderate dehydration but recovered and 2 succumbed to the disease. The characteristics of the organism of food poisoning that produces that produces the severest form of the disease is:
a. Infectivity b. Pathogenicity c. Virulence d. Communicability

32. Treatment of choice in scrub typhus:
a. Doxycycline b. Ampicillin c. Ciprofloxacin d. Erythromycin

NONCOMMUNICABLE DISEASES:

33. Glycosylated hemoglobin reflects the mean glucose level of previous: *(ABKUB, 2018,*
a. 15 days b. 1 month c. 3 months d. 6 months

34. In rheumatic fever, carditis occurs in:
a. 10–20% cases b. 30–40% cases c. 40–50% cases d. 60–70% cases

35. All of the following are major manifestation in rheumatic heart disease, *except*:
a. Carditis b. Polyarthritis c. Chorea d. Fever

36. The prevalence of rheumatic heart disease among school going children (5–15 years) in India is
a. 3 per 1000 b. 6 per 1000 c. 9 per 1000 d. 12 per 1000

37. As per WHO study group, blood pressure should be recorded in the following position:
a. Sitting b. Lying supine c. Standing c. Lying laterally

6. **Which of the following is not a lifestyle modification to manage hypertension?** *(KIMS, 2014)*
   a. Dietary sodium reduction
   b. Regular physical activity
   c. Weight reduction
   d. Intake of saturated fat

7. **All of the following were risk factor intervention trials of coronary heart disease, *except*:** *(ABKUB, 2008)*
   a. Stanford three community study
   b. Andrew and Claudia Liverpool study
   c. North Karelia study
   d. MRFIT

8. **Which of the following is maximally associated with coronary heart disease?** *(ABKUB, 2018)*
   a. HDL
   b. VLDL
   c. LDL
   d. Chylomicron

9. **The following dietary changes are advised to reduce prevalence of CHD, *except*:**
   a. Increased complex carbohydrate intake
   b. Saturated fat intake < 10% of total energy intake
   c. Salt intake < 20 g/day
   d. Reduced fat intake to 20–30% of total energy intake

10. **Which investigation is appropriate to measure mean plasma glucose concentration over past 8–10 weeks?** *(AFUH, 2022)*
    a. FBS
    b. OGTT
    c. HbA1c
    d. Fructosamine test

11. **The major cause of blindness in India is:** *(ABKUB, 2016, 2018; TRIU, 2023; YSRUHSAP, 2023)*
    a. Uncorrected refractive errors
    b. Corneal opacity
    c. Untreated cataract
    d. Glaucoma

12. **The value of the waist hip ratio (WHR) in men which indicates abdominal fat accumulation is:** *(YSRUHSAP, 2023)*
    a. >0.58
    b. >0.85
    c. >1.0
    d. >1.5

13. **Oral cancer accounts for following percentage of all cancers diagnosed in India:** *(ABKUB, 2007)*
    a. 30–40%
    b. 50–70%
    c. 70–80%
    d. 80–90%

14. **Early warning sign of cancer includes:** *(KIMS, 2014; TRIU, 2023; AFUH, 2023)*
    a. Unexplained loss of weight
    b. Blood loss from any natural orifice
    c. Increased appetite
    d. Both a and b

15. **Primary prevention of obesity is:** *(ABKUB, 2018)*
    a. Low fiber diet
    b. High fiber diet
    c. High cholesterol diet
    d. High intake of protein

16. **Blue kits under suraksha clinic contains:** *(BUHI, 2023; AFUH, 2023)*
    a. Azithromycin + Cefixime
    b. Secnidazole + Fluconazole
    c. Acyclovir
    d. Doxycycline + Azithromycin

17. **In India rabies is a/an:** *(TRIU, 2023)*
    a. Sporadic disease
    b. Exotic disease
    c. Zoonotic disease
    d. Holoendemic disease

18. **Treatment regimen for MDR shorter regimen has:** *(BUHI, 2023)*
    a. 7 drugs for 9 months
    b. 6 drugs for 9 months
    c. 7 drugs for 15 months
    d. 6 drugs for 15 months

19. **The WHO initiative of "right to sight" is named:** *(MGUH, 2023; 2024)*
    a. Vision 2015
    b. Vision 2020
    c. Vision 2025
    d. Vision 2030

20. **All of the following factors influence the transmission of a communicable disease after natural disasters *except*:** *(KMAH, 2023)*
    a. Damage to public utilities
    b. Population movements
    c. Interruption in public services
    d. Social reactions

21. **The last case of small pox in India occurred in:** *(TRIU, 2023)*
    a. 1975
    b. 1975
    c. 1977
    d. 1980

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37. As per WHO study group, blood pressure should be recorded in the following position: (ABKUB, 20
a. Sitting b. Lying supine c. Standing c. Lying laterally

38. **Which of the following is not a lifestyle modification to manage hypertension?** *(KIMS, 2014)*
a. Dietary sodium reduction
b. Regular physical activity
c. Weight reduction
d. Intake of saturated fat

39. **All of the following were risk factor intervention trials of coronary heart disease, *except*:** *(ABKUB, 2008)*
a. Stanford three community study
b. Andrew and Claudia Liverpool study
c. North Karelia study
d. MRFIT

40. **Which of the following is maximally associated with coronary heart disease?** *(ABKUB, 2018)*
a. HDL
b. VLDL
c. LDL
d. Chylomicron

41. **The following dietary changes are advised to reduce prevalence of CHD, *except*:**
a. Increased complex carbohydrate intake
b. Saturated fat intake <10% of total energy intake
c. Salt intake <20 g/day
d. Reduced fat intake to 20–30% of total energy intake

42. **Which investigation is appropriate to measure mean plasma glucose concentration over past 8–10 weeks?** *(AFUH, 2022)*
a. FBS
b. OGTT
c. HbA1c
d. Fructosamine test

43. **The major cause of blindness in India is:** *(ABKUB, 2016, 2018; TRIU, 2023; YSRUHSAP, 2023)*
a. Uncorrected retractive errors
b. Corneal opacity
c. Untreated cataract
d. Glaucoma

44. **The value of the waist hip ratio (WHR) in men which indicates abdominal fat accumulation is:** *(YSRUHSAP, 2023)*
a. >0.58
b. >0.85
c. >1.0
d. >1.5

45. **Oral cancer accounts for following percentage of all cancers diagnosed in India:** *(ABKUB, 2007)*
a. 30–40%
b. 50–70%
c. 70–80%
d. 80–90%

46. **Early warning sign of cancer includes:** *(KIMS, 2014; TRIU, 2023; AFUH, 2023)*
a. Unexplained loss of weight
b. Blood loss from any natural orifice
c. Increased appetite
d. Both a and b

47. **Primary prevention of obesity is:** *(ABKUB, 2018)*
a. Low fiber diet
b. High fiber diet
c. High cholesterol diet
d. High intake of protein

48. **Blue kits under suraksha clinic contains:** *(RUJH, 2023; AFUH, 2023)*
a. Azithromycin + Cefixime
b. Secnidazole + Fluconazole
c. Acyclovir
d. Doxycycline + Azithromycin

49. **In India rabies is a/an:** *(TRIU, 2023)*
a. Eporrithic disease
b. Exotic disease
c. Zoonotic disease
d. Holoendemic disease

50. **Treatment regimen for MDR shorter regimen has:** *(RUJH, 20234)*
a. 7 drugs for 9 months
b. 6 drugs for 9 months
c. 7 drugs for 15 months
d. 6 drugs for 15 months

51. **The WHO initiative of "right to sight" is named:** *(MGUB, 2023; 2024)*
a. Vision 2025
b. Vision 2020
c. Vision 2025
d. Vision 2030

52. **All of the following factors influence the transmission of a communicable disease after natural diseases *except*:** *(GOAU, 2023)*
a. Damage to public utilities
b. Population movements
c. Interruption in public services
d. Social reactions

53. **The last case of small pox in India occurred in:** *(TRIU, 2023)*
a. 1971
b. 1975
c. 1977
d. 1980

54. Which of the following disease is eradicated globally? (RUJH, 2024)
a. Small pox b. Polio c. Measles d. Yellow fever

55. Pretransfusion screening in India is recommended for all except: (RUJH, 2024)
a. HIV b. HBV c. Malaria d. Dengue

56. Herpes Zoster is due to latent infection of: (KIMS, 2024)
a. Chicken pox b. Measles c. Toxoplasmosis d. None of the above

57. All are zoonotic diseases, *except*: (SSUHSA, 2024)
a. Brucellosis b. Leptospirosis c. Scabies d. Rabies

58. Suraksha clinic provides services for: (MU, 2024)
a. Leprosy b. Tuberculosis c. STIs d. NCDs

59. All of the following/s are high risk group for HIV, *except*: (SSUHSA, 2024)
a. Female sex workers b. MSM c. Pregnant women d. IUDs

60. High risk group for acquiring HIV are all except: (WBUHS, 2024)
a. Drug users b. Transgenders c. Pregnant women d. Migrant workers

61. World AIDS day is celebrated on: (AFUH, 2024)
a. 1st November b. 30th November c. 1st December d. 31st December

62. Most common opportunistic infection in case of AIDS in India is: (VBUJH, 2024)
a. Tuberculosis b. Pneumocystis pneumonia
c. Typhoid fever d. Leishmaniasis

63. Among sexually transmitted infection/reproductive tract infections (STI/RTI) treatment color coded kits, kit 1 (gray) is for: (WBUHS, 2024)
a. Vaginitis b. Urethral discharge c. Lower abdominal pain d. Genital ulcer

64. In the term " RT-PCR", the words "RT" stands for: (TRIU, 2023)
a. Real time b. Reverse transcription c. Rapid test d. Reviewing transmission

65. "Hundred-day cough" is a name given to: (TRIU, 2023)
a. Diphtheria b. Meningococcal meningitis
c. Acute streptococcal sore throat d. Pertussis

66. Among the first-line drugs for tuberculosis, which of the following is bacteriostatic? (TRIU, 2023)
a. Rifampicin b. INH c. Pyrazinamide d. Ethambutol

67. NIKSHAY is newly launched central government software used for tracking: (AFUH, 2023)
a. High risk newborns b. High risk pregnancies c. Malaria d. Tuberculosis

68. Mycobacterium tuberculosis infection in human is most common because of: (VNSGUS, 2023)
a. Contact b. Inhalation
c. Infiltration d. Inoculation

69. MDR-TB is defined as: (SSUHSA, 2024)
a. Resistance against Rifampicin b. Resistance against INH
c. Resistance against both Rifampicin and INH d. Resistance against 1st line ATT

70. For the treatment of case of class III dog bite, all of the following are correct, *except*: (GNSUB, 2023)
a. Give immunoglobulins for passive immunity
b. Give ARV
c. Immediately stitch wound under antibiotic coverage
d. Immediately wash wound with soap and water

71. **A mother is HBsAg positive at 32 weeks of pregnancy. What should be given to the newborn to prevent neonatal infection?** *(GNSUB, 2023)*
a. Hepatitis B vaccine + Immunoglobulin
b. Immunoglobulin only
c. Hepatitis B vaccine only
d. Immunoglobulin followed by vaccine 1 month later

72. **Acute flaccid paralysis is reported in child aged:** *(GNSUB, 2023)*
a. 0–3 years
b. 0–5 years
c. 0–15 years
d. 0–25 years

73. **Yellow fever certificate of vaccine is valid for:** *(GNSUB, 2023)*
a. 6 years, starting from 6 days after vaccination
b. Lifelong starting from 10 days after vaccination
c. 10 years, starting from 6 days after vaccination
d. 6 years, starting from 10 days after vaccination

74. **In SAFE strategy, S stands for:** *(TRIU, 2023)*
a. Surgery
b. Syringing
c. Streptomycin
d. Suction

75. **A young boy had a flea bite while working in a wheat grain godown. After 5 days he developed fever and had axillary lymphadenopathy. A smear was sent to the laboratory to perform a specific staining. Which one of the following staining methods would help in the identification of the suspected pathogen?** *(RUJH, 2024)*
a. Albert staining
b. Zeihl-Neelson staining
c. McFadyean staining
d. Wayson's staining

76. **Which of the following diseases has a long incubation period?** *(TRIU, 2024)*
a. Measles
b. Typhoid
c. Gonorrhea
d. Influenza

77. **For which of the following diseases man is the dead-end host?** *(TRIU, 2023)*
a. Measles
b. Yellow fever
c. Rabies
d. Tetanus

78. **World diabetes day is celebrated on:** *(MGUB, 2024)*
a. April 7
b. May 31
c. November 14
d. December 1

79. **All are true about Type-2 diabetes mellitus, *except*:** *(KIMS, 2019)*
a. Gradual in onset
b. Commonly presents with complications
c. More commonly results in Keto-acidosis
d. Treatment can be nonpharmacological

80. **Which of the following is not a risk factor for development of diabetes mellitus?** *(TRIU, 2024)*
a. Sedentary lifestyle
b. Protein energy malnutrition in infancy
c. Excessive intake of alcohol
d. High intake of vitamin A

81. **Rule of Halves" in hypertension is an example of:** *(TRIU, 2023)*
a. Iceberg phenomena
b. Spectrum of disease
c. Natural history of disease
d. Various levels of prevention

82. **Modifiable risk factor for hypertension is:** *(TRIU, 2023)*
a. Age
b. Sex
c. Ethnicity
d. Obesity

83. **Modifiable risk factors for hypertension includes all except:** *(DBRAUA, 2024)*
a. Age
b. Obesity
c. Alcohol intake
d. Socioeconomic status

84. **All of the following are modifiable risk factors for hypertension, *except*:** *(SSUHSA, 2024)*
a. Smoking
b. Lack of physical activity
c. Age
d. Excessive salt consumption

85. **CAD Primodial can be prevented by:** *(ABKUB, 2023)*
a. Lifestyle change
b. Coronary bypass
c. Treatment of CAD
d. None of the above

86. **Corpulence index measures:** *(TRIU, 2023)*
a. Hypertension
b. Obesity
c. Diabetes
d. CVA

87. Which index of obesity does not include height? (MU, 2024)
a. Brocca index b. Quetelet's index c. Ponderal index d. Corpulence index

88. The chosen method for measurement of obesity is: (GOAU, 2022)
a. Skin-fold thickness b. Body electrolyte count
c. Height-weight-sex charts d. Basal oxygen consumption

89. The term central obesity refers to: (KIMS, 2022)
a. Abdominal girth b. Waist to hip ratio c. Hip to waist ratio d. None of the above

90. What should be the upper limit of intake of common salt for an adult in a day? (ABKUB, 2022)
a. 1–3 g b. 5–6 g c. 10–15 g d. 20–26 g

91. Which of the following is false for lifestyle disease? (ABKUB, 2022)
a. Have a long latent period
b. Usually related to lifestyle
c. Do not show "common vehicle" pattern of epidemic curve
d. Are mostly caused by infectious agents

92. A 5 years old child complains of poor vision at night with no other refractive error. He is likely to be benefited by: (AKUB, 2024)
a. Vitamin A b. Eye drops containing antibiotics
c. Suitable eyeglasses d. Intraocular lens replacement

93. Use of following reduces mortality in road traffic accidents, *except*: (KIMS, 2022)
a. Seat belt b. Goggles c. Safety belts d. Leather cloths

Answers:

1.	b	**2.**	c	**3.**	b	**4.**	c	**5.**	d	**6.**	c	**7.**	c	**8.**	c	**9.**	b	**10.**	b
11.	c	**12.**	b	**13.**	c	**14.**	c	**15.**	d	**16.**	d	**17.**	a	**18.**	d	**19.**	b	**20.**	c
21	c	**22.**	a	**23.**	c	**24.**	d	**25.**	b	**26.**	c	**27.**	d	**28.**	d	**29.**	b	**30.**	d
31.	c	**32.**	a	**33.**	c	**34.**	d	**35.**	d	**36.**	b	**37.**	a	**38.**	c	**39.**	b	**40.**	b
41.	c	**42.**	c	**43.**	c	**44.**	c	**45.**	a	**46.**	d	**47.**	b	**48.**	d	**49.**	c	**50.**	a
51.	b	**52.**	d	**53.**	b	**54.**	a	**55.**	d	**56.**	a	**57.**	c.	**58.**	c	**59.**	c	**60.**	c
61.	c	**62.**	a	**63.**	b	**64.**	b	**65.**	d	**66.**	d	**67.**	d	**68.**	b	**69.**	c.	**70.**	c
71.	a	**72.**	c	**73.**	b	**74.**	a	**75.**	d	**76.**	c.	**77.**	c	**78.**	c	**79.**	c	**80.**	d
81.	a	**82.**	d	**83.**	a	**84.**	c	**85.**	a	**86.**	b	**87.**	d	**88.**	c	**89.**	b	**90.**	b
91.	d	**92.**	a	**93.**	c														

FILL IN THE BLANKS

1. _____ is the highest TB burden country in the world. (VKSUAB, 2018)
2. Cough for more than _____ weeks not responding to standard treatment for respiratory tract infection should be advised. (SAMU, 2021)
3. Any person with cough more than _____ is suspected to have tuberculosis. (SAMU, 2019)
4. _____ is gold standard for diagnosis of tuberculosis. (KIMS, 2017)
5. Regimen of MDR TB as per RNTCP _____. (VKSUAB, 2018)

6. Pulmonary tuberculosis accounts for over _____ % of the total cases. *(VKSUAB, 2018)*
7. A defaulter is a leprosy patient on MDT, who has not collected treatment for _____ consecutive months. *(VKSUAB, 2013)*
8. Multi-bacillary leprosy follow-up duration is _____ years under NLEP. *(SAMU, 2015)*
9. First _____ was conducted in India in the year _____. *(ABKUB, 2006)*
10. Incubation period of chickenpox is _____. *(ABKUB, 2006)*
11. _____ is the natural reservoir of plague. *(BNMUB, 2005)*
12. Scrub typhus diseases are caused by the _____. *(VKSUAB, 2018)*
13. IgM antibodies against dengue virus appear around _____ days after onset of symptoms. *(VKSUAB, 2014)*
14. The international yellow fever vaccination certificate becomes valid _____ days after vaccination. *(VKSUAB, 2014)*
15. Cell culture derived JE vaccine is based on the _____ strain of JE virus. *(VKSUAB, 2014)*
16. Incubation period of influenza is _____ hours. *(VKSUAB, 2019)*
17. _____ is the recommended drugs for chemoprophylaxis against H5N1 influenza. *(VKSUAB, 2014)*
18. Immunofluorescence assay (IFA) detect antibodies in the serum of SARS patients _____ days after the onset of illness. *(VKSUAB, 2018)*
19. The dose of HRIG is _____. *(VKSUAB, 2014)*
20. The term _____ is used in noninfectious diseases as the equivalent of incubation period in infectious diseases. *(KIMS, 2016)*
21. World cancer day is observed on _____. *(SAMU, 2015)*
22. Baked potato is an example of _____ Glycemic index food. *(KIMS, 2015)*
23. Validity of yellow fever vaccine is _____. *(MU, 2024)*

Answers:

1. India
2. 2 (Two); sputum microscopy examination
3. Two weeks
4. Sputum examination
5. Mfx, Km/Am, Eto, Cfz, Z, H, E (4–6 months)/Mfx, Cfz, Z, E (5 months)
6. 85%
7. 02
8. 5 (Five)
9. PPI; 1995
10. 14–16 days
11. Rodent
12. Rickettsia tsutsugamushi
13. 4–5
14. 10 days
15. SA-14–14-2
16. 24–96 hours
17. Oseltamivir (75 mg OD)
18. 3
19. 20 IU/Kg body weight

20. Latent period
21. Fourth (4th) February
22. Higher
23. Lifelong

TRUE/FALSE

1. Partial blocked flea is more effective vector for bubonic plague transmission. (SAMU, 2015)

Answer:

1. True

CHAPTER 9

Demography and Vital Statistics, Population Stabilization and Medical Genetics

CM9.1: Define and describe the demographic cycle, principles of demography and vital statistics.

Q1. What do you mean by demography? Discuss the different demographic cycles in details. *(WBUHS, 2017, 2019, 2022, 2023; MGUB, 2022, 2023; AFUH, 2022; BNMUB, 2016, 2017; ABKUB, 2015, 2019, 2022; YSRUHSAP, 2023; RGUHS, 2015; TRIU, 2016, 2021; SAMU, 2016, 2022; SSUHSA, 2013, 2017, 2023; TDMGRMU, 2013, 2016; KIMS, 2013, 2024; DU, 2012; SMU, 2013, 2014; NU, 2017, MU, 2022; SDVPG, 2023; VNSGUS, 2023; GNSUB, 2023; DBRAUA, 2024)*

Ans: Demography is derived from Greek words **(Demo = Population and Graphy = measurement or study).** Demography is the scientific study of human population. The history of world population suggests that there is a demographic cycle of 5 stages through which the nation passes **(Fig. 9.1)**.

First stage (high stationary): This stage is characterized by a high birth rate and a high death rate which cancel each other and population remains stationary. India was in this stage until 1920.

Second stage (early expanding): The death rate begins to decline, while the birth rate remains unchanged. Many countries in South Asia and Africa are in this phase. Birth rates have increased in some of these countries possibly as a result of improved health conditions and shortening period of breastfeeding

Third stage (late expanding)/India is in the third stage of demographic cycle-explain *(WBUHS, 2016)*: The death rate declines further and the birth rate tends to fall. The population continues to grow because births exceed deaths. India has entered in this phase.

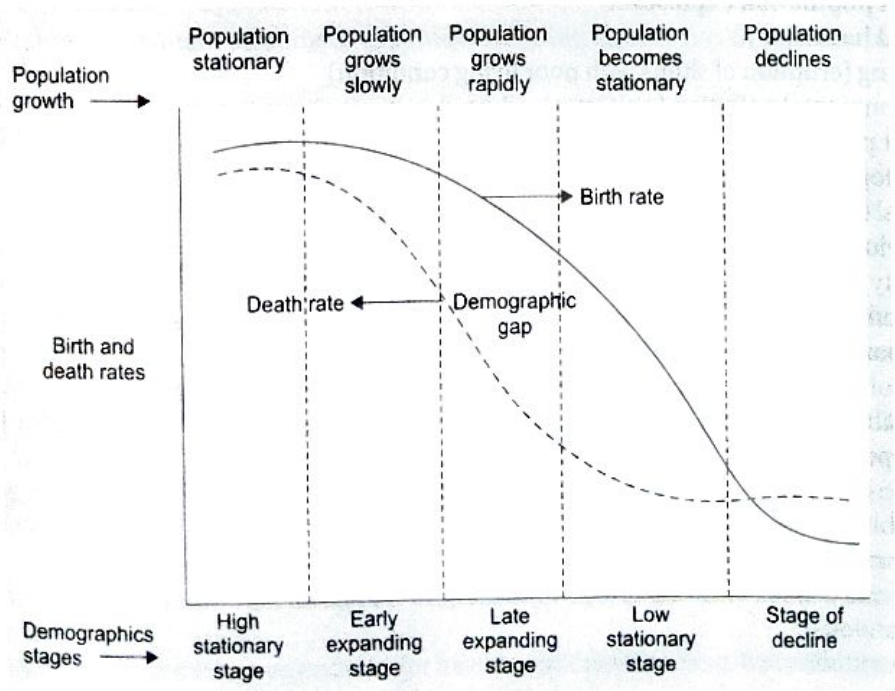


Fig. 9.1: Stages of demographic cycle.

4. **Fourth stage (low stationary):** The stage is characterized by low birth rate and low death rate with the result population becomes stationary. Zero population growth has already been recorded in Australia. In short, more industrialized countries have undergone a demographic transition shifting from a high birth rate and death rate to low birth and death rate.
5. **Fifth stage (declining):** The population begins to decline because birth rate is lower than death rate. Some countries already have reached to this stage.

Principles of demography: India is a country with demographic diversity. Substantial difference are seen between states in respect to demographic indices. The five states Bihar, Madhya Pradesh, Odisha, Rajasthan, and Uttar Pradesh that currently, constitute nearly 40% of total population of India, are projected to comprise 42% of total population by 2021. Again, these states will contribute about 55% estimated increase in population during the period of 1996-2021 and beyond. Currently these states are in 3rd stage of demographic cycle of **"high birth rate-low death rate"**. For Population stabilization at **"low birth rate-low death rate"** status should be achieved in India.

Main sources of demographic data:

- Census (conducted at every 10 years interval)
- Registration of vital events (births, deaths and marriages)
- Population survey
- Sample registration system (SRS)
- National Family Health Survey (NFHS).

CM9.4: Enumerate and describe the causes and consequences of population explosion.

Q2. Define population explosion. What are the demographic trends in India? What measures do you suggest for the control of population explosion? *(WBUHS, 2021; KIMS, 2022; RGUHS, 2018; RUJH, 2013, 2018; TDMGRMU, 2016; AKUB, 2024)*

Ans: Population explosion: Population explosion is the rapid growth of population to an extent when natural resources of the country are unable to support and provide the basic needs. This phenomenon is seen when growth rate exceeds 2%.

Hazards of population explosion:

A. Physical hazards:

- Housing (eruption of slums with poor living condition)
- Environmental pollution (air, water, soil, etc.)
- Vector problems

B. Psychological hazards:

- Mental illness
- Behavioral disorders
- Anxiety
- Tension, worries

C. Social hazards:

- Alcoholism
- Drug abuse
- Corruption
- Broken homes
- Grambling, unemployment
- Antisocial activities
- Theft, murder, sex crimes (rape, prostitution), robbery, child abuse, juvenile delinquency

D. Miscellaneous:

- Malnutrition
- Infections

- AIDS including AIDS
- Accidents
- Degenerative due to stress and strains, etc.

Demographic trends in India:

- India is currently 2nd most populous country in world next to China.
- 16.5 % of world population inhabits in India having 2.4% of land area of the world.
- Since 1921, population of India has increased steadily
- At the time of independence (1947), population of India was 34 crores which become 68 crores by 1981 in just 34 years.
- In another decade, it rose to 91 crores and since then 2 crores people are added to population every year.
- India crossed 1 billion mark (100 crores) by 2001.
- We will soon overtake China very soon if this trend continues, become world no. 1 in population.

Measures for the controlling of population explosion.

Ans: Discussed in CM9.3.

What do you mean by "Demographic Bonus" and "Demographic Burden"? What will be the effect of demographic bonus in India? *(WBUHS, 2024; AKUB, 2023)*

Ans: **"Demographic Bonus"** reveals the period when the dependency ratio in a population declines because of low fertility, until it starts to rise again because of increasing longevity.

Effect:

- This period depends on degree of decline in fertility
- If it switches to small families faster, considerable push to development
- If investment in healthcare and education (especially skill development), maximum advantage is taken of demographic transition with high growth rates.

The term **"Demographic Burden"** is used to increase in the total dependency ratio during any period of time, mostly caused by increased old age dependency ratio.

Effect:

This is inevitable consequences of demographic transition; county has to face the problem sooner or later.

Demographic dividend:

Definition: According to **United Nations Population Fund (UNFPA),** demographic dividend means, **"the economic growth potential that can result from shifts in a population's age structure, mainly when the share of the working-age population (15 to 64) is larger than the nonworking-age share of the population (14 and younger, and 65 and older)".**

The demographic dividend is the economic growth potential that can result from shifts in a population's age structure, mainly when the share of the working-age population (15 to 64) is larger than the nonworking-age share of the population (14 and younger, and 65 and older).

The fact that India has a relatively young population with a median age of 28.4 years is equally important. Approximately 26% of the population is below 14 years and ~67% is between the age of 15 to 64 years and 7% above the age of 65. In contrast, the population over 65 years in US is ~17% and Europe is over ~21%

Decline in fertility rates and improved healthcare and mortality rates. Challenges for demographic dividend of India: Unemployment issue, low human development, gender imbalance, healthcare and inequality and educational disparity.

The demographic dividend is an essential factor for economic development. It provides a rationale for policies that aim for a more balanced population age structure with the help of family planning and birth control.

Advantages associated with demographic dividend: Better economic growth brought about by increased economic activities due to higher working age population and lower dependent population. It will be channelized in following ways:

- **Increased labor force** that enhances the productivity of the economy.
- **Increased fiscal space** created by the demographic dividend to divert resources from spending on children to investing in physical and human infrastructure.
- **Rise in women's workforce** that naturally accompanies a decline in fertility, and which can be a new source of growth.
- **Increase in savings rate,** as the working age also happens to be the prime period for saving.
- A massive shift towards a middle-class society, that is, the **rise of aspirational class.**

2d. Population doubling time is inversely related to growth rate of that population—Justify. *(AKUB 2023)*

Ans: Growth rate: When crude death rate is subtracted from crude birth rate then we will get annual growth rate, exclusive of migration.

Table 9.1: Relation between growth and population.

Rating	*Annual growth rate (%)*	*Number of years required for the population to double in size*
Stationary population	No growth	
Slow growth	< 0.5	>139
Moderate growth	0.5 to 1.0	139-70
Rapid growth	1.0 to 1.5	70-47
Very rapid growth	1.5 to 2.0	47-35
Explosive growth	2.0 to 2.5	35-28
Explosive growth	2.5 to 3.0	28-23
Explosive growth	3.0 to 3.5	23-20
Explosive growth	3.5 to 4.0	20-18

Table 9.1 revealed that population doubling time in relation to growth rate. If growth rate is more less time taken (years) to double the population.

So, we come to a conclusion that population doubling time is inversely related to growth rate of that population.

Q2e. Demographic transition has a role in economic growth of nation—Explain. *(WBUHS 2022)*

Ans: Demographic transition denotes change in population size from a condition in which both birth rate and death rates are high or another condition in which both of these rates are low. Before and after transition, population size is relatively stable. Many of the developed countries have already reached the new equilibrium at a low level, where as many of the developing countries still at the beginning or somewhat within the transitional phase and thus are confronted with a rapid population increase.

Economic implication: The rising population disturbs all norms. In health and ICDS sector, the rising population has increased demand of sub-centers, primary health centers, community health centers and district hospitals and AWW centers. The population norms are difficult to meet because of rising costs. The population is spread over to small villages which are sometimes remote and not easily accessible at the same time increasing slum population poses serious problems to establish primary health care services. The coverage of services seriously affected to rapid increase in population. It is difficult to provide sustained quality of services against the available resources (money, manpower and materials).

Q1. Describe population dynamics of India and its consequences.

Q1. Describe population dynamics of India and its consequences.

Ans: Population dynamics is the study of changes in population size and structure. The determinant of population growth are the number of births and deaths and amount of in and out migration. Population structure refers to age and sex structure and its distribution in geographical area. Change in fertility and mortality levels modifies population structure. The age group of 0–6 years shows a declining trend, in 1991 it was 15.9% and in 2011 it was 13.1%. Census 2011 confirms this decline due to declining fertility trends across the country. The base of age pyramid, constituted by 0–4 years age group is shrinking which is again positive sign of success of family welfare program.

Age groups of less than 14 years shows declining trend. India had 42% of population of children below 14 years of age in the year 1971, was declined to 35.35% in 2001, declined to 31% in 2011 and further declined to 25.5% in 2021, as many states have achieved the replacement level of fertility.

On the other hand, the population of 15–59 age group is having a rising trends which was 52% in 1971, 56.94% in 2001, 60% in 2011 and projected rise to 64.4% in 2021.

Population growth in India continues to be high due to:

- The large size of population in the reproductive age group is mainly responsible for population growth (estimated 58%). An addition of 417.2 million in year 1991–2016 is anticipated despite substantial reduction in family size in several states including those, which have already achieved replacement level of TFR.
- Higher fertility due to unmet needs for contraception (estimated contribution 20%)
- High wanted fertility due to high infant mortality rate (estimated contribution 20%)
- Population of above 60 years is consistently rising due to increase in life expectancy.

Consequences: Population of India has increased from 230 million in 1901 to 1210 million in 2011 and has crossed 1361 million in July 2021. It is now growing by 16–18 million each year and likely to reach 1518 million by 2036. We have to ensure food supply, water, shelter, schools, employment, health facilities and other basic amenities for this massive population within limited resources. Again, health problems of elderly population would be a challenge also.

Q2. Define, calculate and interpret demographic indices including birth rate, death rate, and fertility rates.

Q2. Define, calculate and interpret demographic indices.

Ans: Demographic indices can be divided into two parts: Population statistics and vital statistics

1. **Population statistics** deals with size, distribution, composition by age and sex, sex ratio, density of population, etc.
2. **Vital statistics** deals with birth rare, death rate and fertility rate.

Fertility rate (fertility-related statistics): *(AFUH, 2023; YSRUHSAP, 2019; VNSGUS, 2023, MGUB, 2023)*

a. **Crude birth rate (CBR)**

$$\text{CBR} = \frac{\text{Number of live births during the year in an area}}{\text{Estimated mid-year population}} \times 1{,}000$$

As per SRS 2020, CBR is 19.5 per 1,000 population

- **Inequalities:** CBR is higher in rural and urban slum areas, states like Bihar, UP and MP having higher CBR above 24 per 1,000 population, Kerala had the lowest birth rate of 13.2 *(SRS, 2020)*
- **Limitations:** It is called crude because the whole population is used as denominator but the females of reproductive age group (15–49 years) are able to produce children. Generally, girls below 15 and women above 49 years of age are unable to produce children.

b. **General fertility rate (GFR):**

$$\text{GFR} = \frac{\text{Number of live births in an area in a year}}{\text{Number of female population of reproductive age group (15–49 years) in the same area in same year}} \times 1{,}000$$

So, GFR = (3,200/25,000) × 1,000 = 128 per thousand women of reproductive age group (15–49 years)

GFR is a better measure of fertility than crude birth rate because denominator is restricted to the number of women in the child-bearing age rather than whole population.

The major weakness of GFR is that not all the women in the denominator are exposed to the risk of childbirth.

c. **General marital fertility rare (GMFR):** It is the "number of live births per 1,000 married women in the reproductive age group (15–49 years) in a given year"

$$\text{GMFR} = \frac{\text{Number of live births in a year in an area}}{\text{Mid-year married female population in the age group of 15–49 years in the same area in same year}} \times 1{,}000$$

d. **Age specific fertility rate (ASFR):**

$$\text{ASFR} = \frac{\text{Number of live births in a particular age group}}{\text{Mid-year female population of same age group}} \times 1{,}000$$

e. **Age specific marital fertility rare (ASMFR):**

$$\text{ASMFR} = \frac{\text{Number of live births in a particular age group}}{\text{Mid-year married female population of the same age group}} \times 1{,}000$$

f. **Total fertility rate (TFR):** Total fertility rate represents the average number of children a women would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group. It is computed by summing the age specific fertility rates for all ages, 5-year age groups are used, the sum of the rates is multiplied by 5. This measure gives the approximate magnitude of "completed family size".

$$\text{TFR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASFR}}{1{,}000}$$

Total marital fertility rate (TMFR): Average number of children that would be born to a married women if she experiences the current fertility pattern throughout her reproductive span.

$$\text{TFR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASFR}}{1{,}000}$$

h. **Gross reproduction rate (GRR):** Average number of girls that would be born to a woman if she experiences the current fertility pattern throughout her reproductive span (15–49 years), assuming no mortality.

$$\text{GRR} = \frac{5 \times \sum_{15\text{-}19}^{45\text{-}49} \text{ASFR for female live births}}{1{,}000}$$

i. **Net reproduction rate (NNR): Net reproductive rate and its significance** *(BNMUB, 2011; AKUB 2022; PBDSUHSH, 2015; YSRUHSAP, 2012; RGUHS, 2013, 2014; SSUHSA, 2016; DU, 2015; SMU, 2015; NU 2016; KIMS, 2019; VBUJH, 2023; GOAU, 2021; VNSGUS, 2023; TRIU, 2024)*

- Net reproductive rate (NRR) defined as number of daughters a newborn will bear during her lifetime assuming the fixed age specific fertility and mortality rates.

- NRR is a demographic indicator. NRR in India is 1.5 (1990). NRR = 1 is equivalent to attaining approximately 2 child norms. If NRR is below 1 then the reproductive performance of the population is below replacement level. Target was fixed by GOI for achieving NRR = 1 but not yet successful. If at least 60% of eligible couples are effectively practicing family planning methods, then the goal of NRR = 1 can be achieved.

j. **Couple protection rate (CPR)** *(RGUHS, 2008; SSUHSA, 2006; BUMP, 2012)*

- Couple protection rate (CPR) are the percentage of eligible couples effectively protected against childbirth by one or other approved methods of contraception, i.e., condom, OC pills, IUD and sterilization. CPR is an indication of the prevalence of contraceptive practice in the community.
- By attaining CPR 60%, it is almost equivalent to cut off almost all third or higher order of births, leaving two or less than two children per couple, so that it is possible to achieve net reproduction rate of one.

$$\text{CPR} = \frac{\textbf{Total no. of eligible couples protected by any approved methods of family planning}}{\textbf{Total no. of eligible couples in the community}} \times 100$$

k. **Child-women ratio:** It is the number of children 0–4 years of age per 1,000 women of child-bearing age, usually. Defined as 15–49 years of age. This ration is used where birth registration statistics either do not exist or not adequate. It is estimated through data derived from census.

l. **Pregnancy rate:** It is the ratio of number of pregnancies in a year to married women in the age group of 15–49 years. The number of pregnancies includes all pregnancies whether these had terminated as live births, stillbirths or abortions or had not yet terminated.

m. **Abortion rate:** The annual number of all types of abortions, usually per 1,000 women of child-bearing age (usually defined as ages of 15–44).

n. **Abortion ratio:** This is calculated by dividing the number of abortions performed during a particular time period by the number of live births over the same period.

o. **Marriage rate:** It is the number of marriages in the year per 1,000 population.

$$\textbf{General marriage rate} = \frac{\textbf{Number of marriages within 1 year}}{\textbf{Number of unmarried persons age of 15–49 years}} \times \textbf{1,000}$$

Difference between general fertility rate and total fertility rare: Construct the Ans from above discussion.

Q3. What are the factors responsible for high fertility in India? Describe in detail about the strategy for controlling the situation. *(WBUHS, 2020; BNMUB, 2013; RGUHS, 2008; SMU, 2011; RUJH, 2017, 2023)*

Ans: Factors responsible for high fertility in India are as follows.

- **Age at marriage:** The age at which female marries and enters the reproductive period of life has a great impact on her fertility. Early marriage, particularly in rural India, is associated with high fertility.
- **Duration of married life:** This is higher in our country, because of early marriage and it is associated with high fertility.
- **Spacing of children:** Inadequate spacing of children is also associated with a high fertility rate in our country. Studies have shown that when all the births are postponed by 1 year, in each group, there was a decline in total fertility.
- **Education:** There is an inverse association between fertility and education status. Education provides knowledge, increased exposure to information and media, increases the female participation in family decision making.
- **Economic status:** Poor economic status in our country is associated with high fertility rate because economic status bears an inverse relationship with fertility.
- **Religion and caste:** Muslim religion and SC/ST/BPL is associated with high fertility.
- **Nutrition:** These appears to be some relationship between nutritional status and fertility level. A significant proportion of population in our country is suffering from under-nutrition, which is associated with high fertility rate in our country.

- **Lack of family planning:** Large number of eligible couples are unprotected in our country, which is a key factor for high fertility rate in our country.
- **Other factors:** Fertility is affected by a large number of physical, biological, social and cultural factors. These factors are as follows: Widow marriage, breastfeeding, value of children in society, customs and beliefs and industrialization and urbanization, etc.

Strategies for controlling high fertility in India: TFR (total fertility rate) targeted in our country is 2.1. Different strategies are adopted for controlling high fertility. Expansion in choice of contraceptives and others are included as follows.

- **Expansion in choices of contraceptives:** Newer methods like injectable contraceptives, centchroman, emergency contraceptives, natural methods like lactational amenorrhea (LAM), standard day method (SDM) in addition to OCP, IUD, condom, permanent sterilization etc.
- **Capacity building of human resources** to deliver quality family planning services along with strengthening of management of public institutions.
- **Each PHC/CHC will have at least one MO trained** in one surgical method of sterilization.
- **Provision of IUD insertion at sub-center level**
- **To involve private sector in providing quality family planning services** at reasonable rate. Social marketing of contraceptives, especially in rural areas, is being strengthened by broadening the range of methods, marketing of products and improving services through social franchising
- **AWWs are trained for counseling,** community mobilization, provision of OCP, condoms as well as advice on natural methods
- **One couple from each village will be selected by villagers** themselves and will be trained to provide counseling and services such as pills, condom, lactational amenorrhea
- **BCC (behavior change communication):** This approach tries to change the established mode of behavior. It will encourage behaviors that are doable in context in which people live and are also amenable to change. BCC will be focused on improving the image of public health facilities, promoting new services and improving health seeking behavior. A combination of mass media, social mobilization and interpersonal communication will be used. Priority target groups for BCC will be service providers in the public and private sector, panchayat, religious and other village leaders, mother-in-law, adolescents, couples with one or more children and couples wishing to have no more children.

CM9.3: Enumerate and describe the causes of declining sex ratio and its social and health implications.

Q4. Define sex ratio. What are the factors behind the declining of the sex ratio in India? What are the measures adopted to correct the situation? *(WBUHS, 2015, 2019, 2021, 2022, 2023, 2024; DU 2013; TRIU, 2023; SSUHSA 2020)*/**Gender bias and health.**

Ans: Sex ratio is defined as "number of females per 1,000 males". One of the basic demographic characteristics of the population is sex composition. The sex composition of the population is affected by the differentials in mortality conditions of males and females, sex selective migration and sex ratio at birth. "Female deficit syndrome" is considered adverse because of social implications.

Sex-ratio at birth in India in 2014–16 was 898 females per 1,000 males, highest in Chhattisgarh 963 and in Haryana 832 females per 1,000 males.

The factors behind the declining of the sex ratio in India are as follows (gender bias and health):

- Strong male child preference and consequent gender inequities
- Neglect girl child resulting higher mortality at younger age
- Female feticide
- Female infanticide
- Higher maternal mortality
- Male bias in enumeration of population
- Easy availability of sex determination test and abortion services

- Illiteracy especially female
- Ignorance.

The measures adopted to correct the situation are as follows:

- Increase literacy rate especially female
- Female empowerment in policy making in family level
- Male and female child should give same preference
- Awareness campaign on adverse effect of declining female child population
- Strict use of preconception and prenatal diagnostic techniques as and when indicated
- Penalties for agencies for use of prenatal diagnostic techniques for sex selection after conception and subsequent abortion services
- Health care is same for male and female child.

Q. Describe characteristics of age and sex composition of population. *(KIMS, 2013; BNMUB, 2014; RGUHS, 2009)*

Ans: As per age and sex distribution of population of India in 2012 revealed that in 0–14 years male population is about 1.4% more than female but in 60+ age groups female population is 0.8% more than male population.

The proportion of population below 14 years of age showing decline, whereas the proportion of elderly in the country is increasing. This trend is continued in the time to come. The increase of elderly population will impose a greater burden on the already outstretched health services in India.

The proportion of population in the age group of 0–14 years is higher in rural areas (30.5%) than in urban areas (25.2%) for both male and female population.

Q. Population pyramid is important for public health. *(WBUHS, 2014; RGUHS, 2011; BUMP, 2012; BNMUB, 2023; ABKUB, 2023)*/**Population pyramid in developing and developed countries** *(MU, 2023)*

Ans: This a graphical presentation showing percentage of different age group of male and female population.

The age pyramid of India is typical of developing countries like with broad base and tapering top.

In developed countries like Switzerland, the pyramid is bulge in the middle and has a narrowest base. Seeing the pyramid, age structure can be easily assessed. Productive population and dependent population also can be found out from the pyramid **(Figs. 9.2 and 9.3)**.

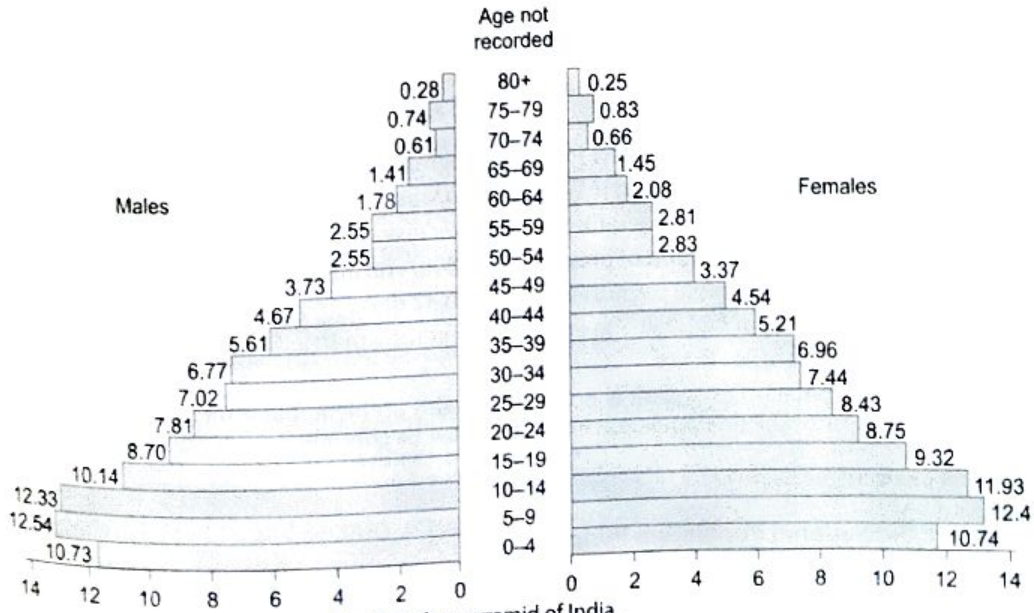


Fig. 9. 2: Age pyramid of India.

CM9.5: Describe the methods of population control.

Q6a. Describe the methods of population control.

Ans: Population control and its stabilization is a multi-sectoral endeavor. It should involve the participation of the community as well as religious affiliation.

Population stabilization means measures to control population explosion which could be achieved by either reducing birth rate or increasing death rate. Since, death rate cannot be increased, the only method of population stabilization is to reduce birth rate to a level lower than death rate such that birth rate will negate death rate.

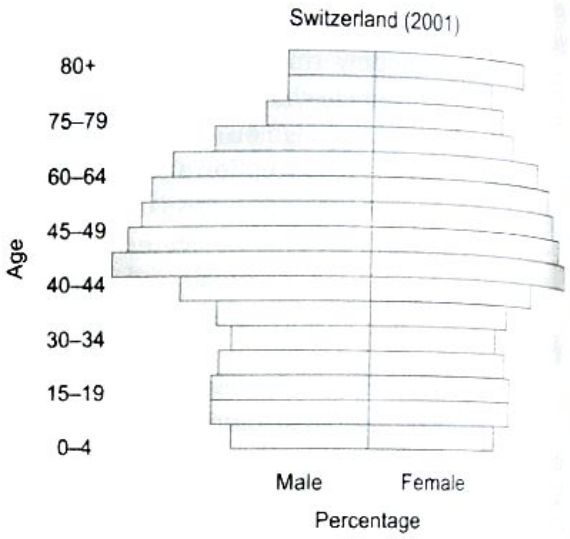


Fig. 9.3: Age pyramid of Switzerland

Reduction of birth rate:

- **Adopt two child norms:** Through population education and behavior change communication by using mass media approach for universal access to information and counseling services.
- **Ensure child survival and safe motherhood by:**
  - Reducing neonatal, infant and child mortality and morbidity.
  - Ensuring safe motherhood—through safe pregnancy, safe abortion, safe delivery and safe
  - Puerperium and reducing maternal mortality rate as well as nutritional status of women and children.
- **Birth control measures:**
  - Includes family planning methods like promoting use of contraceptives, sterilization, etc.
  - Limiting family size and spacing—through contraceptive services to reduce unmet need
  - Increase male participation in contraception (sterilization).
- **Non-birth control measures:**
  - Delay the marriage of girls: Girl's marriage not earlier than 18 years, preferably after 20 years. Strict implementation of Child Marriage Restraint Act, 1976.
  - Free compulsory education up to 14 years under Right to Education Act and vocational training for girls to delay marriages. Hence, effort should be directed to raise literacy level of female through—establishment of Anganwadi centers, enrolment of all children especially female children for primary education, reducing drop-out rate, encouraging adult literacy.
  - Aggressive implementation of **PC and PNDC Act, 2014** to improve child sex ratio and prevent sex determination and sex selective abortions.
  - Implement ***Beti Bachao and Beti Padhao*** program to improve declining child sex ratio.
  - Promote ***Pradhan Mantri Matru Vandana Yojana***. It is conditional maternity benefit scheme under ICDS. Eligible pregnant and lactating mothers receive cash incentive of ₹ 5,000/- in three instalments of ₹ 1,000/- for early registration of pregnancy, ₹2000/- on antenatal checkup and ₹ 2,000/- on registration of childbirth and complete immunization up to 42 days.
  - One time incentive of ₹ 21,000/- to eligible girls getting married after 18 years ***(Apna Beti Hamari Beti)***
  - Implementation of **MTP Act.**

Significance: Population explosion is not only a health problem, but a social problem, economic problem and demographic problem. Population explosion must be controlled to save human civilization.

CM9.6: Describe the National Population Policy.

Q6b. Describe the National Population Policy.

Ans: National Population Policy (NPP), 2000

In 1983, the National Health Policy fixed the goal for replacement levels of total fertility rate to be achieved by 2000 AD.

Major goal of NPP, 2000: To improve quality of life and stabilize population.

Objectives of NPP, 2000:

- **Immediate:** To address the unmet needs of contraception, health care infrastructure and health care personnel, and to provide integrated service delivery for basic reproductive and child health care.
- **Medium term:** To bring total fertility rate (TFR) to 2.1 as replacement level.
- **Long-term:** To achieve a stable population by 2045 at a level consistent with the needs of sustainable economic growth, social development and environmental protection.

National Sociodemographic Goals 2010:

1. Address the unmet needs for basic reproductive and child health services, supplies and infrastructure
2. Make school education up to age 14 free and compulsory, reduce dropouts at primary and secondary school levels to below 20% for both boys and girls.
3. Reduce infant mortality rate to below 30 per 1,000 live births
4. Reduce maternal mortality ratio to below 100 per 10,0000 live births
5. Achieve universal immunization of children against all vaccine preventable diseases
6. Promote delayed marriage for girls, not earlier than age 18 and preferably after 20 years of age
7. Achieve 80% institutional deliveries and 100 deliveries by trained persons
8. Achieve universal access to information/counseling and services for fertility regulation and contraception with a wide basket of choices.
9. Achieve 100% registration of births, deaths, marriages and pregnancies
10. Contain the spread of AIDS and promote greater integration between the management of reproductive tract infection (RTI) and sexually transmitted infections (STIs) and the National AIDS Control Organization.
11. Prevent and control communicable diseases
12. Integrate Indian Systems of Medicine (ISM) in the provision of reproductive and child health services and reaching out to households
13. Promote vigorously the small family norm to achieve replacement level of TFR
14. Bring about convergence in implementation of related social sector programs so that family welfare becomes a people-centered program.

Q2. Write down the sociodemographic goals for 2015. *(WBUHS, 2015)*

Ans: The sociodemographic goals for 2015:

1. Ensure continuation of national economic growth with security, peace and stability, and ensure GDP growth rate of at least 8% annually and GDP per capita to be at least USD 1,700.
2. Achieve the Millennium Development Goals by 2015, and adopt appropriate technology and skills, and create favorable conditions for graduating the country from LDC by 2020.
3. Ensure sustainability of development by emphasizing economic development with cultural and social progress, preserving natural resources and protecting the environment.
4. Ensure political stability, peace and an orderly society.
5. Overall directions:
   - Develop all aspects of national economy: Build a strong base for sustained economic growth
   - Make dynamic changes towards rural development, historical and focal development areas and poverty eradication
   - Sociocultural, economic development and environmental protection must reinforce each other
   - Increase enforcement and effectiveness of public administration, reform democratic state in the direction of rule of law, ensure equality and justice in society
   - Ensure national defense and security across the country in order to maintain political stability, and social order
   - Increase cooperation with friendly countries at regional and global levels and raise competitiveness at the regional and international levels
   - Implement industrialization and modernization strategies in a progressive way.

National Demographic Goals for 2025 and beyond for population stabilization:

- To bring the total fertility rate to replacement level of 2.1
- Achieve 100% registration of births, deaths, marriages and pregnancies
- Promote delayed marriage of girls, not earlier than 18 and preferably after 20 years
- Reduce IMR to 28 per 1,000 live births
- Reduce MMR to below 100 per 10,0000 live births by 2025 and under-5 mortality to 23.
- Achieve population stabilization by 2045.

CM9.7: Enumerate the sources of vital statistics including Census, SRS, NFHS, NSSO, etc.

Q8. What do you mean by vital statistics? Discuss how you will collect and compile vital events in a city area. *(BNMUB, 2002; MU, 2022; GNU, 2023)*

Ans: Registration of vital events has been the foundation of vital statistics.

The United Nations define a vital events registration system as "legal registration, statistical recording and reporting of occurrence of, and collection, compilation, presentation, analysis and distribution of statistics pertaining to vital events, i.e., live birth, deaths, fetal deaths, marriage, divorces, adoptions, legitimations, recognitions, annulments and legal separations."

India has a long tradition of registration of births and deaths. In 1873, the Government of India had passed the Births, Deaths and Marriages Registration Act, but the Act provided only for voluntary registration. Afterwards, individual states like Tamil Nadu, Karnataka and Assam passed their own Acts. The data being grossly deficient in regard to accuracy, timeliness, completeness and also coverage. Illiteracy, ignorance, lack of concern and motivation is another weak area.

Birth registration death registration: *(BNMUB, 2002; RGUHS, 2009; GOA, 2023)*

Birth registration is an important part of civil registration system. The details of the number of births and deaths occurring annually are very important not only for predicting the future course of population dynamics but also for a planned social and economic development of the country. Without the knowledge of such an event, any type of planning has to rely either on guess estimates of these events or some indirect estimates provided by the demographers. The vital event of birth registration is grossly under-registered once upon a time. To combat this situation, Birth and Death Registration Act is introduced in our country in 1969.

The Act came into force on 1st April 1970. According to this Act, the registration of births and deaths have been made compulsory at the place of occurrence with local registrar under whose jurisdiction it has occurred, throughout the country. The Act also stated that compilation of vital statistics in the states so as to ensure uniformity and comparability of data.

Responsibility of reporting of events: For domiciliary events, the responsibility for reporting is assigned to the head of the household or nearest relative or oldest adult male person. In case of institutional deliveries, the medical officer in charge of institution is responsible.

Responsibility of registration: Local registrars have the responsibility to register these events. In rural areas, the registrars are Panchayat secretary/Revenue official/Block development officer/Community health center/Block Primary health center/Primary health center in-charge/teacher of Government School. It varies from state to state. Panchayat Pradhan is the sub-registrar of vital events (births, deaths, etc.) in West Bengal.

In urban areas, municipal committee/corporation holds the responsibility to register these events.

Procedures for registration: Events of birth should be registered within prescribed period of 21 days of occurrence, with the local registrar. After 21 days but with late fee, after 30 days and within 1 year with written permission of prescribed officer by producing an affidavit, after 1 year of occurrence by an order of executive magistrate with prescribed late fee are few rules in case of late registration.

Procedure followed all over India: Every registrar is required to send periodical returns to the Chief Registrar who send their reports to the Registrar General of India. On the basis of the annual vital statistics returns received from the states, the Registrar General of India brings out a comprehensive annual report entitled "Vital Statistics of India".

Collection and compilation of vital events in a CHC area: In the village level of CHC area, information on birth and death are being collected by ASHA and AWW in respective village. They compiled these information and send to ANM. In fourth Saturday, meeting in panchayat office was further revised if any addition of birth and death already occurred in the area. Then the ANM compiled all information in monthly sub-center reporting format. In the monthly PHC report all information on sub-center under PHC was compiled. In the same way all PHCs report were compiled as monthly CHC report.

In the above mentioned method, the vital events of a CHC area were collected and compiled.

Q. Describe Census. *(WBUHS, 2019; AKUB, 2022; BNMUB, 2018; ABKUB, 2019; RGUHS, 2010; SSUHSA, 2015, 2018; KIMS, 2016, 2024; NU, 2014, 2017)*

Or

The Census is an important tool of health information—explain. *(WBUHS, 2016, 2021; AKUB, 2023)*

Ans: Census is defined by the United Nations as "the total process of collecting, compiling and publishing demographic, economic and social data pertaining at a specified time or times to all persons in a country or delimited territory". The first regular census was taken in 1881 and others took place at every 10 years interval. The last census was held in March 2011. The census is usually conducted at the end of the **first quarter of** the first year in each decade. The reason can be explained in a way that most people are usually resident in their home during this period. The census was completed in two phases.

In the first phase house listing operation is done. All buildings and structures, residential and partly residential or nonresidential were identified, listed and recorded. Information on houses, household amenities and assets are collected.

In the second phase, population enumeration is done in more detail on each individual residing in the country. In census 2011, the canvassing of questionnaire was done from 9th of February 2011 to 28th of February 2011. A revision round was conducted from 1st to 5th March 2011.

Census providing information on total population, sex distribution, sex ratio, age groups, population density, decadal growth rate, rural-urban ratio, literacy status, religion, marital status, living conditions, work participation, disability status. This information is available at national, state and district level. Village wise, town wise information on total population is available online. Detailed information can be accessed free of cost at census data online at *http://www.censusindia.gov.in.*

Census 2011 also includes type of house, main source of drinking water, lighting, latrine and bathing facility within premises, possession of computer, internet, landline and mobile telephone. Information was also available on the number of live births during last 1 year. Currently provisional population totals for census 2011 are available in a website.

Q. Describe sample registration system (SRS) in India. *(WBUHS, 2022; MGUB, 2022; ABKUB, 2007; VKSUAB, 2020; PBDSUHSH, 2017; RGUHS, 2013; TRIU, 2016; TDMGRMU, 2015, 2016; DU, 2011, 2013; KIMS, 2023, 2024)*

Or

Sample registration system provides more reliable estimates of birth and death rates at national and state level than other existing systems. *(WBUHS, 2019)*

Ans: Sample registration system (SRS) is a large-scale demographic survey conducted in India for providing reliable annual estimates of birth rate and other fertility and mortality indicators at the national and sub- national level. It was started in 1964–1965 by office of the Registrar General, India on pilot basis and now covers entire nation since 1969–70.

Objective: To provide reliable estimates of birth rate, death rate and infant mortality rate at rural areas and at the state level for urban areas.

Components:

- Baseline survey of the sample units to obtain usual resident population of sample areas

- Independent retrospective half yearly surveys for recording births and deaths which occurred during the 6 months under reference and updating the household list, household schedule and list of women in reproductive age group along with their pregnancy status by the supervisor
- Matching of events recorded during continuous enumeration and those listed in course of half yearly survey
- Field verification of unmatched and partially matched events
- Filling of verbal autopsy forms for finalized deaths.

Procedure:

- Done once in 6 months
- A part time resident enumerator, generally a teacher does continuous field investigations regarding births and deaths in a sample unit which is followed by a independent survey half yearly by an investigator supervisor, i.e., it is a dual record system.

Sample as Dual Record System:

- A stratified simple random sample
- A sample unit has population of 1,500 in rural areas and 1,000 in urban areas and there are currently 6,671 such sample units (4,436 rural and 2,235 urban)
- Infant mortality is the decisive indicator of sample size at natural division.

National Family Health Survey (NFHS): NFHSs are large scale demographic and health surveys being conducted nationwide since 1992-1993. NFHS-5, the fifth in NFHS series conducted in 2019-21, provide information on indicators on, health and nutrition for India and each state/Union Territory. NFHS-4 was conducted in 2015-2016 and for the first time, it provides district level estimates for many health indicators. These surveys provide information on key health indicators and trends for India.

Population and household profile focusing on social determinants of health, marriage and fertility, infant and child mortality rate, current use of family planning methods, unmet need for family planning, quality of family planning services, maternal and child health (maternal care, delivery care, child immunization, treatment of childhood diseases, child feeding practices and nutritional status of children), BMI of adults, anemia among children and adults, blood sugar level among adults, hypertension among adults, knowledge on HIV/AIDS among adults, women empowerment and gender-based violence, tobacco use and alcohol consumption among adults, preschool education, disability, access to toilet, death registration and reasons for abortion.

Uses of NFHS:

- It evaluates the effectiveness of ongoing national health programs like RMNCAH+N family planning, the national immunization program, nutritional interventions and communicable and noncommunicable diseases programs.
- It helps in planning and interventions of national program
- NFHS data having cut-off levels for various indicators, which can be used as reference standards and for case definitions, problem-based learning and self-directed learning
- It can enhance medical education, especially the learning of community medicine.

National Sample Survey Office (NSSO): National sample survey (NSS) are large scale nationwide surveys to generate information on health (morbidity data) since 1953. Full scale survey on morbidity was conducted in 1973-1974. Morbidity data are now being conducted as part of the decennial surveys on social consumption. The last survey on social consumption was conducted during NSS 75th round (July 2017; June 2018)

Information collected from NSSO: NSSO is the primary source of basic information in the health sector such as- morbidity, hospitalization, prenatal and postnatal care received by women, expenditure on treatment received from public and private sector.

Key information generated from 75th round of NSSO are as follows:

- Proportion of ailing persons
- Rate of hospitalization
- Spell of ailments and its treatment

- Treatment cost for admitted patients (hospitalization)
- Treatment cost for nonhospitalized patient
- Number of childbirth, place of child birth and expenditure on institutional child birth and maternity care
- Usual monthly per capita consumer expenditure on health.

SHORT NOTES AND RELEVANT QUESTIONS

Q11. What is a demographic gap? *(RGUHS, 2003, 2008, 2014; TDMGRMU, 2010)*

Ans: The difference between the birth rate and death rate marked in a graph is called demographic gap **(Fig. 9.4)**.

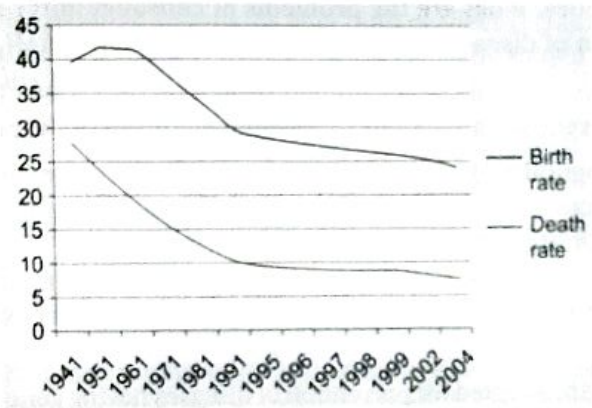


Fig. 9.4: Demographic gap.

Significance: Demographic gap can be used to compare the health status among various communities and countries. It also serves as an indicator for noting health progress of a community.

Q12. Age at marriage and its significance. *(BNMUB, 2011)*

Ans: The age at which a female marries and enters the reproductive life has great impact on fertility. According to Registrar General of India, it revealed that female who married before 18 years gave birth to large number of children than those who married after 18 years. If the marriage was postponed from 16 to 21 years, number of birth-decreased to 20-30%. Early marriage is a long-established custom in India. The Child Marriage Restraint Act of 1978 raises the legal age of marriage from 15 to 18 years for girls and 18 to 21 years for boys. Since then, gradual rise of age of marriage has been observed. The mean age at marriage for girls already moved to 20 years in 2006. In the rural area early marriages are taking place.

Q13. NRR may be regarded as a superior method than GRR for measuring population growths - Justify. *(WBUHS, 2015)*

Ans: The **Net Reproduction Rate (NRR)** is defined as the number of daughters a newborn will bear during her life-time, assuming the fixed age-specific fertility and mortality rates. NRR is a demographic indicator. **NRR in India is 1.5 (1990).** NRR = 1 is equivalent to attaining approximately 2 child norms. If NRR is below 1 then the reproductive performance of the population is below replacement level. Target was fixed by GOI for achieving NRR = 1 but not yet successful. If at least 60 % of eligible couples are effectively practicing family planning methods, then the goal of NRR = 1 can be achieved.

GRR: This is average number of girls that would be born to a woman if she experiences the current fertility pattern throughout her reproductive span (15–49 years) assuming no mortality.

In population growth, mortality must be considered for calculation of growth pattern. This mortality is taken care of in NRR whereas this mortality is ignored in GRR. So NRR is regarded as a superior method than GRR for measuring population growth.

Q14. Define contraceptive prevalence rate. *(BUMP, 2022)*

Ans: Contraceptive prevalence rate: It is estimated that during 2015-2016, about 53.5% of eligible couples in the reproductive age groups 15-44 year were effectively protected against conception by one or the other family planning method.

The view of demographers are that the demographic goal of NNR = 1 can be achieved only if CPR is more than 60 %. **Net reproductive rate (NNR) of 1 is equivalent to attaining approximately the two-child norm.**

GENETICS AND HEALTH (MEDICAL GENETICS)

Q15. Define preventive genetics. What are the problems of consanguinity? Discuss in brief the measures available for prevention of diseases having genetic background *(SAMU, 2015)*/**Prevention of genetic disorders.** *(RGUHS, 2012, 2013; GOAU 2021)*

Ans: Preventive genetics: It is the scientific study of prevention and control of hereditary disorders.

The problems of consanguinity: When blood relatives marry each other is an increased risk in the offspring of traits controlled by recessive genes and those determined by polygenes. Health problems are albinism, alkaptonuria, phenylketonuria and increased risk of premature death.

Death rate was 116 per 1,000 in certain Japanese city during the first 8 years of life amongst the offspring of first cousins and 55 amongst the controls. So, lowering of consanguineous marriages would be advocated in the community.

The following measures are adopted for prevention of diseases having genetic background:

A. Health promotive measures:

- **Eugenics measures:***(BNMUB, 2011; RGUHS, 2014; VKSUAB, 2018; TDMGRMU, 2012, 2015; KIMS, 2023)* Galton proposed the term eugenics for the science which aims to improve the genetic endowment of human population. Eugenics has both negative and positive aspects.
  - **Negative eugenics:** It is the improvement of the population by killing weak and defective and those with undesirable characteristics. If people suffering from serious hereditary diseases are sterilized or otherwise debarred of producing children, there should be no serious objection to marriage. The aim of negative eugenics is to reduce the frequency of hereditary diseases and disability in the community as low as possible. But in spite of eugenic sterilization, new cases of hereditary diseases will continue to arise in the population partly because of fresh mutation and partly because of marital alliances between hidden carriers of recessive defects. Nevertheless, it may be hoped that should eugenic measures be applied, hereditary diseases would become less frequent.
  - **Positive eugenics:** It seeks to improve the genetic composition of the population by encouraging the carriers of desirable genotypes to assume the burden of parenthood. At present, positive eugenics has very little application. Its realization is difficult for two reasons. Firstly, the majority of socially valuable traits like intelligence and positive character features, though partly determined biologically are not inherited in such a simple way such as blood groups. These traits have a complex, multifactorial determination, both genetic and environmental. It would be difficult to expect that eugenic measures will yield direct results.

    Secondly, we cannot determine which gene we transmit to our children.
- **Euthenics:** It is the manipulation of the immediate environment of man because environment has an influence on the genetic development by enabling the genes to express them readily [Environmental manipulation]. Manipulation means altering external factors, such as education and controllable environment, including the prevention and removal of contagious diseases, education regarding employment, home Economics, sanitation and housing.
- **Genetic counseling** *(WBUHS, 2019, 2020, 2022; AKUB, 2017, 2019, 2022; BNMUB, 2014, 2022; PBDSUHSH, 2017; MGUB, 2023; TRIU, 2021; RGUHS, 2012, 2014; TDMGRMU, 2014, 2015; KIMS, 2015,*

SAMU, 2016; SMU, 2011, 2015; RUJH, 2012, 2022)/**Importance of genetic counseling in preventive genetic disorders** *(WBUHS, 2017; BNMUB, 2020)*

Genetic counseling is a process of offering advice to individuals to improve the genetic constitution at the level of individual family.

Genetic counseling may be prospective and retrospective.

- Prospective counseling: This approach requires identifying heterozygous individuals for any particular defect by screening procedures and explaining to them the risk if they marry another heterozygote for same gene. If the heterozygous can be prevented and reduced, the affected children will be diminished. Examples of such problems are sickle cell anemia and, thalassemia.
- Retrospective genetic counseling *(SAMU, 2022)*

  Most genetic counseling are retrospective. Here the hereditary disorder has already occurred within the family. Couples reported voluntarily after birth of affected child.

  A survey by WHO showed that genetic advice was chiefly sought in connection with congenital abnormalities, mental retardation, psychiatric illness, inborn error of metabolism but only a few sought premarital advice. WHO recommended genetic counseling center for sickle cell anemia and thalassemia.

- **Other measures:**
  - Prevention of consanguineous marriages thus preventing diseases like albinism, phenylketonuria and alkaptonuria.
  - Avoiding late marriages can prevent certain chromosomal abnormalities like trisomy 21.

B. Specific protection:

- Protection of individuals and communities against mutagens like X-rays, ionizing radiations, mutagenic chemicals.
- Protection of gonads in individuals undergoing X-rays examination
- Avoiding X-ray examination in pregnant women
- Immunization of pregnant mothers against rubella
- Immunization of Rh-negative mothers with anti-D globulin to prevent erythroblastosis fetalis.

C. Early diagnosis and treatment:

- Detection of genetic carriers: Healthy genetic carriers of many genetic disorders especially inborn errors of metabolism can be identified, and such individuals should be counseled.
- Prenatal diagnosis: Prenatal diagnosis is an early detection technique employed in secondary prevention of genetic disorders.

  Methods:

  - **Ultrasonography:**
    - ◊ It helps in visualizing fetal information's, fetal growth abnormalities
    - ◊ It also helps in monitoring invasive prenatal diagnostic techniques, such as amniocentesis and, chorionic villi sampling.
  - **Amniocentesis:**
    - ◊ It is transabdominal of amniotic fluid from uterus for biochemical tests, cultures of fetal cells and karyotyping
    - ◊ It is performed preferably between 14 and 16 weeks of gestation.

    Indications:
    - ◊ A mother aged 35 years or more (high-risk of Down syndrome)
    - ◊ Mother with a child with Down syndrome or other chromosomal anomalies
    - ◊ Parents with known chromosomal translocation
    - ◊ Parents who have had a child with a metabolic defect, could be detected by amniocentesis
    - ◊ Family history sex-linked genetic disorder where sex determination is warranted.

    Investigations:
    - ◊ Biochemical tests help detect neural tube defects, anencephaly and spina bifida by elevation of serum alpha fetoprotein

- ◊ Culture of fetal cells detects inborn errors of metabolism
- ◊ Karyotyping detects chromosomal aberrations (Down syndrome, trisomy 18)

– **Chorionic villi sampling:**
- ◊ It is done to obtain fetal trophoblastic tissue to study fetal DNA and enzymes found in amniocytes
- ◊ It also helps to detect biochemical and structural anomalies.

- **Neonatal screening:** Neonate is subjected to battery of examination procedures to detect genetic disorders as follows:
  - Clinical examination to detect congenital dislocation of hip, congenital hypothyroidism
  - Biochemical tests detect phenylketonuria, G6PD deficiency
  - Hb electrophoresis to detect sickle cell anemia, thalassemia
  - Immunoreactive trypsin measurement to detect cystic fibrosis
- **General population genetic screening:** This identifies individuals at risk of developing hereditary disorders before appearance of any systems by analyzing DNA
- **Rehabilitation:**
  - With many genetic or partially genetic conditions causing physical or
  - Mental disability, much can be done for the patient and for his family in helping them to lead a better and more useful life.
- **Conclusion:** Genetic disorders, though rare, are important health concerns and can be prevented if appropriate preventive strategy is adopted in time.

Q16. Explain genetic diseases. *(SAMU, 2004; BNMUB, 2019; PBDSUHSH, 2015; RGUHS, 2024)*

Ans: These may be classified as:

A. Chromosomal abnormalities
B. Unifactorial (single gene Mendelian) diseases
C. Multifactorial disorders

A. **Common symptoms associated with abnormality of sex chromosome** *(BNMUB, 2015; RGUHS, 2008; TDMGRMU, 2013)*/**Genetic disorder of sex chromosome** *(BNMUB, 2016; RUJH, 2023, 2024; VBUJH, 2023)*

- The common syndromes associated with abnormalities of sex chromosomes are as follows:

i. **Klinefelter's syndrome** *(RGUHS, 2007)*
This is a common sex chromosomes aneuploidy. Persons suffering from this syndrome are abnormal males having two or more X-chromosomes in addition to one Y-chromosomes (XXY, XXXY). They have a normal autosomal set of 22. The affected persons are eunuchoid males with nonfunctional testes. Spermatozoa are absent during ejaculations. The growth of hair on face, axilla and pubes (pubic area) is scanty. This condition is associated with gynecomastia and mental retardation. The incidence is about 1 in 1,000 among males at birth.

ii. **XYY syndrome:** The male with an extra Y-chromosome has attached much attention because they are reported as antisocial, aggressive and criminal behavior. The features are exceptional height (usually 6 feet and above) along with serious personality disorders.

iii. **Turner's syndrome** *(BNMUB, 2014):* This is the most common chromosome disorder in humans, but about 98% of conceptuses abort spontaneously. In the remaining 2% which reach the term account for incidence of 1 in 7,500 live born girls. The sufferers are apparent females with underdeveloped sex glands. They have 45 chromosomes instead of 46.
Clinically the patients are of short stature with primary amenorrhea. They often show other congenital defects such as coarctation of aorta, pulmonary stenosis, renal malformations and mental retardation.

iv. **Super females:** Higher number of X chromosomes (XXX, XXXX, XXXXX) is observed here. Features are greater degree of mental retardation, under-developed external genitals, uterus and vagina.

- **Related to autosomes/Down's syndrome** *(RGUHS, 2014)*
There are many syndromes associated with abnormalities of autosomes. Mongolism is a public health problem in some countries like United States of America, Canada. Mongolism or Down's was described

by **Longdon Dawn** in 1966. The most cases of mongolism are caused by an extra chromosome which occurs on the 21st pair. The anomaly is therefore described as **"Trisomy 21".** The syndrome is easily recognized in the older child and adults by the short stature and small round head, narrow, tilted eye-slits, mal-formed ears, short broad hands, lax limbs, mental retardation and quite a few other abnormalities especially internal congenital defects such as cardiac defects and atresia of the alimentary tract. In communities of European origin, the incidence of mongolism at birth is reported to be one in 900 births.

One observation which is important is that the frequency of mongolism increases with rising maternal age but is unaffected by the age of the father. The risk for a woman of 20 is estimated at about 1 in 3,000 and that for a woman of 45, 1 in 50.

Autosomal monosomies are rare. Loss of an entire chromosome is very serious genetic defect; the fertilized ovum may not survive.

B. **Unifactorial (single gene or Mendelian) diseases:** Mendelian diseases are inherited according to the Mendelian laws. These are the dominant, recessive and sex-linked diseases.

- An individual with an autosomal dominant trait will produce two kinds of gametes with respect to the mutant gene-half with the mutant gene and half with the normal allele. The offspring of such an individual has a 50:50 chance of being affected, provided the other parent is normal. The sexes are equally affected.
- Abnormalities caused by recessive genes occur when both parents are heterozygous. Each off spring of such parents has a chance of 1:4 being affected. Autosomal recessive diseases occur sporadically in the children of outwardly normal parents.
- In sex linked inheritance, a mutant gene on X-chromosome in males will express itself readily as there is no normal allele, while a mutant gene on X-chromosome in females will not express itself in the presence of the normal allele. This is the basis of sex-linked inheritance of which hemophilia is an outstanding example. If an affected male marries a normal female, the gene is transmitted to all the daughters, but the sons escape. But, if a carrier female marries a normal male, 50% of her daughters will be carriers and 50% normal; 50% of her sons will be affected and 50% normal.

Mendelian diseases are individually rare since there is strong selection against them, and gene mutations are rare events. Mutation usually occurs at random. If mutation is confined to a single gene it is called "point" mutation, which is responsible for many human diseases and defects.

It is estimated that the combined incidence in man of diseases and disabilities in this category is about 1% of all live-born individuals. It a rare disease, as many as 793 autosomal dominant phenotypes, 629 autosomal recessive traits and 123 sex-linked diseases have been catalogued to date.

C. **Multifactorial disorders:**

- The frequency of multifactorial disorders is high compared with that of Mendelian and chromosomal disorders. There are indications that most of the common disorders of adult life such as essential hypertension, schizophrenia, mental retardation, duodenal ulcer, ischemic heart disease of early onset, diabetes, congenital heart malformations are conditions with a multifactorial etiology. A small minority of cancers (family cancer syndromes) are clearly inherited, these include familial polyposis coli, familial nonpolyposis colon cancer and some thyroid cancers and also cancer of the colon and breast. It is very difficult to distinguish familial from nonfamilial cases.
- In a disorder such as cancer or coronary heart disease, features that should arouse suspicion of an inherited predisposition include early onset; similarly affected parents and/or siblings. In ethnic groups in which there is a high incidence of a particular condition (e.g., spina bifida is 40 times more common in **Caucasians** - and even more frequent among the **Irish** - than in **Asians.**
- The mode of inheritance of multifactorial disorders is complex because environmental factors are also involved, as for instance, the influence of smoking, diet, obesity and lack of exercise on ischemic heart disease. Campbell (1965) stressed that environmental agents and genetic constitutions usually interact closely in producing abnormalities. He summarizes his conclusion in saying that some

genetic factors are effective only under certain environmental conditions. The relative contributions of genetic predisposition and environmental factors to the etiology will vary greatly from patient to patient.

SHORT NOTES AND RELEVANT QUESTIONS

Q17. Describe premarital genetic counseling to a young lady whose parents are sickle cell positive. *(AIIMS 2022; SAMU, 2013, KIMS, 2023; VNSGUS, 2023)*

Ans: The huge burden of sickle cell disease (SCD) coupled with a correspondingly high morbidity and mortality has made it really imperative to invest more to reduce the prevalence of this disorder. SCD genetic counseling and testing have been shown to educate individuals on SCD and also offer those at risk the opportunity of making informed decisions on marriage and pregnancy. More advanced countries with significant populations of patients with SCD and other hemoglobinopathies have evolved functional genetic and counseling protocols with remarkable impacts on disease epidemiology.

Sickle cell disease (SCD) is a group of inherited disorders of hemoglobin (Hb) in which the sickle Hb is present in association with abnormal Hb. It is the most common single gene disorder in the world and huge people are born yearly with HbSS globally; majority of these births occur in sub-Saharan Africa. Historically the homozygous HbSS disease, HbSβ-thalassemia (HbSβ-Thal), HbS plus C, D, and E (HbSC, HbSD and HbSE respectively) are commonly included under the classification of SCD. The geographical distribution of these Hb variants differs and often parallels certain attributes such as climatic conditions and malaria endemicity. The prevalence of the carrier rates for HbS ranges from 5 to 40% among populations in the endemic areas this thus drives disease epidemiology.

The current utilization of genetic counseling and testing for SCD is unacceptably low in view of the high prevalence even in endemic countries. This will not only adversely affect health policy planning but also could in addition continue to fuel the already high carriage rate of the *S* gene in the country, with attendant high morbidity and mortality in individuals born with the disease.

People who inherit one sickle cell gene and one normal gene have sickle cell trait (SCT). People with SCT usually do not have any of the symptoms of sickle cell disease (SCD), but they can pass the trait on to their children.

- If both parents have SCT, there is a 50% (or 1 in 2) chance that any child of theirs also will have SCT if the child inherits the sickle cell gene from one of the parents. Such children will not have symptoms of SCD but they can pass SCT on to their children.
- If both parents have SCT, there is a 25% (or 1 in 4) chance that any child of theirs will have SCD. There is the same 25% (or 1 in 4) chance that the child will not have SCD or SCT.

The following need to be urgently addressed by health policy makers to address this huge deficit:

- Country-wide provision of adequate infrastructure (including facilities for carrying out polymerase chain reaction) to enable proper testing.
- Extensive health education to increase the understanding of SCD and the need for voluntary testing particularly in at-risk groups.
- Strengthening existing facilities for managing SCD patients in hospitals and providing health insurance to affected groups, with a view to possibly reducing the "power to cure" and "power to care" gap.
- CBC, MCV, and reticulocyte count are basic examinations. Hemoglobin separation by electrophoresis, isoelectric focusing or high-performance liquid chromatography (HPLC) shows FS pattern. DNA studies may be used to confirm genotype.
- The family may be contacted to inform them of the screening result.
- Two persons with SCT should not marry where traits will persist among 50% of following generations 25% will suffer from SCD.

Screening a young lady whose parents are sickle cell positive will help the family, society and at large the nation prevent the incidence of more cases of sickle cell disease.

Q18. Explain gene therapy. *(SAMU, 2008; RIJH, 2021)*

Ans: Gene therapy is the introduction of a gene sequence into a cell with the aim of modifying the cell's behavior in a clinically relevant fashion. It may be used in several ways, e.g., to correct a genetic mutation (as for cystic fibrosis), to kill a cell (as for cancer) or to modify susceptibility (as for coronary artery disease).

The gene may be introduced using a virus (usually a retrovirus or adenovirus) or by means of lipid or receptor targeting. There is now almost universal agreement that gene delivery to somatic cells to treat disease is ethical, and that gene therapy should take its place alongside other forms of medical treatment.

Q19. Human genome project. *(RGUHS 2008, TDMGRMU, 2010; GOAU, 2021)*

Ans: The Human Genome Project was an international scientific research project with a primary goal to determine the sequence of chemical base pairs which make up DNA and to identify approximately 20,000–25,000 genes of the human genome from both a physical and functional standpoint.

A working draft of the genome was released in 2000, and a complete one in April 2003, with further analysis still being published. Preliminary count indicates about 20,000-23,000 genes in the human genome.

Objective:

To understand the genetic makeup of human species and complete map of all findings.

Applications in Medicine:

Study of individual gene and its function

It can show a predisposition to a variety of illnesses, including breast cancer, cystic fibrosis, liver disease, etc.

A deeper understanding of the disease processes at the level of molecular biology may determine new therapeutic procedures.

Q20. Write in brief the role of genetic predisposition in common diseases. *(RGUHS, 2012)*/**Genetic factors in cancer.** *(RUJH, 2010)*

Ans: Role of genetic predisposition in common disorders:

- **Cancer:**
  - 10–25% of cancer of breast or colon is genetically determined
  - Numerous tumors have been identified that affect individual susceptibility to tumor development.
- **Coronary heart disease:** Major risk factors of coronary heart disease like high blood pressure and high blood cholesterol level are genetically influenced.
- **Diabetes:**
  - 85% cases of diabetes in developed countries are of noninsulin dependent form which has a strong familial tendency
  - Identical twins (25–30%) have higher predisposition of insulin dependent diabetes mellitus compared to non-identical twins (5–10%).
- **Mental disorders:** Common mental disorders like Alzheimer's disease, etc., have shown strong genetic predisposition

Conclusion: Knowledge of genetic predisposition in common disorders has helped to introduce family-oriented approach into medical practice. Based on this knowledge, efforts are made to develop appropriate therapies and their application in preventive medicine.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Which of the following is not a vital statistic?** *(ABKUB, 2023)*
   a. Natural growth rate b. Fertility rate c. Sex ratio d. Life expectancy at birth
2. **Births in India must be registered within:** *(ABKUB, 2020; AFUH, 2023; MGUB, 2024)*
   a. 7 days b. 14 days c. 21 days d. 1 month

3. **At present India is in the demographic cycle of:** *(KIMS, 2016, 2019; SSUHSA, 20[illegible])*
   a. High stationary b. Early expanding c. Late expanding d. Low stationary

4. **True about late expanding phase of demographic cycle:** *(AFUH, 20[illegible])*
   a. Birth rate is lower than death rate
   b. Death rates begin to decline while the birth rate remains unchanged
   c. Death rate declines still further, and birth rate tends to fall
   d. High birth rate and high death rate

5. **Declining death rate and more declining birth rate, the stage is:** *(ABKUB, 20[illegible])*
   a. Late expanding b. Early expanding c. High stationary d. Declining

6. **Age pyramid of India has:** *(ABKUB, 20[illegible])*
   a. A bulge in the middle and a narrow base b. A broad base and tapering top
   c. A broad top and tapering base d. A broad base and bulging top

7. **The literacy rate of India for the year 2011 is:** *(YSRUHSAP, 20[illegible])*
   a. 43.57% b. 52.21% c. 65.38% d. 74.04%

GENETICS AND HEALTH:

8. **Which of the following is not needed in DNA transcription?** *(SAMU, 20[illegible])*
   a. Ribosomes b. Nucleotides c. DNA d. Enzymes

9. **ABO blood group system is an example of ..... trait.** *(KIMS, 20[illegible])*
   a. Autosomal recessive b. Sex linked recessive c. X linked dominant d. Autosomal dominant

10. **XO constitution is present in:** *(ABKUB, 20[illegible])*
    a. Turners syndrome b. Down's syndrome c. Klinefelter's syndrome d. Superfemales

11. **An example of a sex-linked recessive disease is:** *(YSRUHSAP, 20[illegible])*
    a. Neurofibromatosis b. Albinism
    c. Hemophilia d. Vitamin D-resistant rickets

12. **Which of the following is the foundation of vital statistics?** *(WBUHS, 20[illegible])*
    a. Census b. Registration of vital events
    c. Sample registration system d. Notification of diseases

13. **The authority for overall administration and conduct of census in India is the:** *(SSUHSA, 20[illegible])*
    a. Registrar of Birth and Death b. Census Commission of India
    c. Secretary, Ministry of Home Affairs d. Union Health Minister

14. **You have been passed with studying the sex structure of a population with high rate of mortality, which of the following methods will you prefer to use:** *(RUIH, 20[illegible])*
    a. Lifetable analysis b. Correlation coefficient c. Population pyramid d. Component bar chart

15. **The disease most ideally suited for population genetic screening is:** *(MGUR, 20[illegible])*
    a. Retinoblastoma b. Hemophilia
    c. Phenylketonuria d. Klinefelter's syndrome

16. **A woman delivers a baby boy at term with Down's syndrome. The most likely cause is:** *(RUIH, 2023; VBUIH, 20[illegible])*
    a. An extra chromosome 21 b. No 2nd sex chromosome
    c. Phenotype effect only d. Extra Y chromosome
    e. Oligospermia

17. **Highest birth rate is seen in which stage of demographic cycle?** *(VNSGUS, 20[illegible])*
    a. Stage-1 b. Stage-2 c. Stage-3 d. Stage-4

18. **Crude birth rate is a simplest measure of fertility because it includes:** *(GNSUB, 2023)*
a. Total population b. Mid-year population c. Live birth only d. Preterm birth

19. **The denominator of general fertility rate is:** *(GNSUB, 2023)*
a. Mid-year population of women of 15–44 years of age
b. Total year population of women of reproductive age group
c. Average population of women in a year
d. Any of the above

20. **The number of live births per 1,000 women in the reproductive age group in a year refers to:** *(WBUHS, 2024)*
a. Total fertility rate b. Gross reproduction rate
c. Net reproduction rate d. General fertility rate

21. **Not true regarding the Birth and Death Registration Act, 1969:** *(AKUB, 2023)*
a. Compulsory registration of birth and death
b. Birth should be registered within 14 days and death within 21 days
c. Both birth and death should be registered within 21 days
d. Aadhar number is a must for registration of death

22. **Completed family size is given by:** *(DBRAUA, 2024)*
a. Total fertility rate b. Crude birth rate c. Net reproduction rate d. Gross reproduction rate

23. **A child is born to an Indian couple outside India. Birth registration must be done:** *(GNSUB, 2023)*
a. Within 21 days of arrival into India b. Within 21 days
c. Within 60 days of arrival to India d. Within 60 days

24. **Indian census will not provide information related to _____ aspect of community:** *(KIMS, 2023)*
a. Demographic b. Social c. Economical d. Morbid

25. **National Family Health Survey has successfully completed:** *(VBUJH, 2023)*
a. Three rounds b. Four rounds c. Five Rounds d. Six rounds

26. **National level demographic data is provided on yearly basis by:** *(DBRAUA, 2024)*
a. National Family health survey b. Sample Registration system
c. Civil Registration survey d. Sentinel Surveillance

27. **You have been passed with studying the age and sex structure of a population with high rate of mortality, which of the following methods will you prefer to use:** *(RUJH, 2023)*
a. Lifetable analysis b. Correlation coefficient c. Population pyramid d. Component bar chart

28. **Which of the following is not secondary data?** *(AFUH, 2023)*
a. Report of census 2011 b. A clinical trial c. Death certificates d. Case sheets in hospital

29. **Environmental manipulation which enables genes to express themselves readily is known as:** *(VNSGUS, 2023)*
a. Positive Eugenics b. Negative Eugenics c. Euthenics d. Genetic counseling

30. **Giving assess to suitable environment for ready expression of genes is called:** *(WBUHS, 2024)*
a. Eugenics b. Population genetics c. Euthenics d. Human genome project

Answers:

1.	c	**2.**	c	**3.**	c	**4.**	c	**5.**	d	**6.**	a	**7.**	d	**8.**	a	**9.**	d	**10.**	a
11.	c	**12.**	b	**13.**	b	**14.**	c	**15.**	c	**16.**	a	**17.**	a.	**18.**	b	**19.**	a	**20.**	d
21.	b	**22.**	a	**23.**	c	**24.**	d	**25.**	c	**26.**	b	**27.**	d	**28.**	b	**29.**	a	**30.**	c

FILL IN THE BLANKS

1. The stages of demography cycle are _____
2. India is in _____ phase of demographic cycle
3. The time limit for registering the event of births and that of deaths is _____ all over India.
4. Census is taken in India regularly in _____ years.
5. _____ are the units of heredity.
6. Amniocentesis for prenatal diagnosis of chromosomal anomalies is done at _____ of pregnancy.
7. Net reproduction Rate (NNR) =1 can be achieved only if couple protection rate exceed _____
8. The effect of environment on genes is called _____

Answers:

1. High stationary, early expanding, late expanding, slow stationary and declining
2. Late expanding
3. 21 days
4. 10 (Ten)
5. Genes
6. 14–20
7. 60%
8. Epigenic modification

FILL IN THE BLANKS

1. The stages of demography cycle are _____ (SAMU 2022)
2. India is in _____ phase of demographic cycle (SAMU 2019)
3. The time limit for registering the event of births and that of deaths is _____ days uniformly all over India. (SAMU 2016)
4. Census is taken in India regularly in _____ years. (KIMS 2015)
5. _____ are the units of heredity. (VKSUAB 2019)
6. Amniocentesis for prenatal diagnosis of chromosomal anomalies is done at _____ weeks of pregnancy. (KIMS 2015)
7. Net reproduction Rate (NNR) =1 can be achieved only if couple protection rate exceed _____ (MU 2024)
8. The effect of environment on genes is called _____. (MU 2024)

Answers:

1. High stationary, early expanding, late expanding, slow stationary and declining
2. Late expanding
3. 21 days
4. 10 (Ten)
5. Genes
6. 14–20
7. 60%
8. Epigenic modification

CHAPTER 10

Reproductive, Maternal, Newborn, Child, Adolescent Health and Nutrition (RMNCAH+N)

CM10.1: Describe the current status of Reproductive, Maternal, Newborn and Child Health and common health problems.

Q1. Describe current status of reproductive and maternal health. *(YSRUHSAP, 2023; GNSUB, 2023)*

Ans: About 23.3% of girls get married by the age of 18 years resulting in teenage pregnancy. Every year in India, about 30 million women experience pregnancy and 27 million have live births. Every year about 44,000 pregnancy related maternal deaths occur in the country and many more suffer from pregnancy related morbidities. Coverage of full antenatal care in India remains around 26%. About 89.4% deliveries are attended by skilled birth attendants and about 12% deliveries are conducted at homes. Proportion of safe deliveries is about 88% and about 78% received postnatal care within 48 hours **(Source NFHS-5)**.

Unacceptable very high maternal mortality in some states like Assam, UP, MP and Rajasthan. Rural areas experience high maternal mortality in comparison to urban areas. Common causes of maternal deaths are anemia, hemorrhage, abortion, toxemia, obstructed labor, puerperal sepsis are known and preventable also. For every women who dies, about 20 more women suffer injuries, infections and pregnancy related morbidity. "Maternal near miss" a term used for women who survived as near death complications of pregnancy or child birth.

Health problems of women:

- High birth rate of 20 per 1,000 population
- Spacing between births less than 3 years in 48%
- High maternal mortality 113/100,000 live births
- Malnutrition in women and adolescent girls (Anemia)—57%
- Early marriage before 18 years—23.3%
- Teenage pregnancies (15–19 years)—6.8%
- Gender discrimination and violence—29.3%

Current status of child health in India:

Each year around 27 million babies are born in India around 10% of them do not even survive up to 5 years of age. Neonatal mortality, infant mortality and child mortality continues to be unacceptably high. Causes of childhood mortality are prematurity, sepsis, asphyxia, diarrhea, acute respiratory infections, are mostly preventable.

One-fifth of babies born in India tend to be of low birth weight (<2500 g). About 36% below the age of 5 years are underweight and 38% stunted reflecting widespread malnutrition. On account of overcrowding and indoor air pollution the young children are exposed to acute respiratory infections, diarrhea and measles.

Feeding practices in many young children are not proper also neonatal care is very poor in urban slums. Moreover, adverse female child sex ratio 914.

CM10.3: Describe local customs and practices during pregnancy, childbirth, lactation and child feeding practices.

Q1a. Describe local customs and practices during pregnancy, childbirth, lactation and child feeding practices.

Ans: Common local customs and practices during pregnancy, childbirth, lactation and child feeding practices are given below:

During pregnancy and childbirth:

- In some part of our country pregnant women wear red or green glass bangles from 7th month of pregnancy
- The sound of these bangles is believed to reach the womb and comfort the fetus
- Some women return to their parental home. This may cause missing of antenatal appointments
- To have a healthy and peaceful pregnancy, the mother should not look upon ugly things
- To have an easy birth, the mother should walk and focus on prayers
- In some countries bowing to elder is polite and respectful
- In some countries people take their shoes off before entering the house
- In some places people sit on the floor to eat
- Eating sweets lead to a male child, and sour foods lead to female child
- Some foods are not given to pregnant mothers like eggs, meat, fish, and milk and even after delivery, foods are being restricted for lactating mothers
- Nutrition-related practices during pregnancy are based on a belief that 'hot' foods are harmful and related with occurrence of abortion, 'cold' foods are beneficial
- Sugar, jaggary, groundnuts, almonds, coconut, palm dates, mangoes, millets, maize, fried foods, eggs and meat are considered hot foods
- Buttermilk, card, milk, apple, green grams, green leafy vegetables and burley flour are considered cold foods. Cold foods are recommended in early pregnancy to avoid miscarriage
- People believe that papaya consumption may lead to abortion
- Hot foods are encouraged during the last stages of pregnancy to facilitate labor
- Taking only vegetarian food may lead to vitamin B deficiency
- Black grams, beans, whole buffalo milk and ghee are generally believed to be heavy foods are being associated with indigestion and colic hence avoided by mothers
- Rice, green gram, curd, wheat porridge (dalia), bread slices and diluted milk are believed to be light foods hence encourage during pregnancy
- Rice, potatoes and cauliflower are commonly believed to be wind producing foods
- Cucumber and watermelon are considered to be cold and windy foods and suspect to cause joint pains, body ache, etc.
- Ghee, sugar, jaggary and coconut are encouraged with the belief that these foods help in evacuation of secretions of uterus and helps involution of uterus
- By suggesting a suitable combination of the so-called hot food with cold food and heavy food and light food in desired proportions, we could overcome the usual objections.

During lactation and child feeding:

- **Certain age-old customs and beliefs:** Depriving the baby from first milk or colostrum, branding of skin, application of cow-dung to the cut end of umbilical cord, faulty feeding practices and early weaning
- Prolonged breastfeeding, oil bath, massage and controlled exposure to sun are good habits
- Punching the ear and nose, application of oil and other materials in anterior fontanel
- Applying of 'Kajal' mixed with oil to the head and eye lids for beautification and partly from warding off the effects of "evil eye."
- Bathing naked is a taboo
- After child birth, there may be two or three emotional baths and time is fixed upon the advice of priest
- Used instruments for shaving are unsterile and also not having any idea of microorganisms. This is done by traditional barber (nai) in the countryside
- Practice of oil bath is a good Indian custom
- Womenfolk groups use a paste consisting of gram, mustard oil and turmeric power and rub on the body of child before bath.

Miscellaneous: About 12% of deliveries are conducted at home in India.

- Deliveries may be conducted by untrained traditional birth attendant (dai) whose method of conducting deliveries are unsafe, e.g., nonwashing of hands, use of unclean blade, unclean tie, unclean surface and covering umbilical cord with dirty linen are some of the harmful practices

- All dais pointed out that the delivery is considered to be an impure or dirty process, hence the family or mother-in-law selected a discarded room may be a store house which is devoid of light, air, dust believed to be harmful for mother and newborn
- After delivery, the mothers are confined to that particular room for varying from 10 to 40 days
- The floor of such rooms often kacha and deliveries are done on unclean floor. Discarded gunny bag or old clothes are laid on floor as cushion (mattress). This arrangement is done for the satisfaction of birth attendants (dais) as it is facilitating easy disposal of products of labor
- Disposable delivery kits (DDKs) are seldom provided to birth attendants by health worker female.

QM10.4: Describe child survival and safe motherhood interventions (CSSM), RCH-I, CNA and RCH-II.

Q10.4 Describe child survival and safe motherhood interventions.

Ans: The child survival and safe motherhood (CSSM) program was launched on August 1992 by the President of India. It is having high priority for improving the health status of women and children and reduction of maternal, infant, child mortality and morbidity rates.

CSSM program was directed at achieving 9 of the 17 goals of the National Health Policy 1983 which are related to maternal and child health. It integrates UIP + Family planning + MCH.

Interventions for reducing morbidity and mortality in children includes:

- Essential newborn care
- Universal immunization
- Oral rehydration therapy to prevent diarrheal diseases
- Treatment of ARI
- Vitamin A prophylaxis

Intervention to reduce maternal mortality includes:

- TT/Td immunization
- Prevention and treatment of anemia
- Training of traditional birth attendants and provision of disposable delivery kits (DDK) for promoting safe deliveries
- Promotion of institutional deliveries
- Strengthening of peripheral health institutions (FRU)
- Management of obstetric emergencies and its complications
- Birth spacing and promotion of family planning

It addresses major causes of morbidity and mortality in women and children which are preventable by readily available cost-effective interventions. Many of these activities are ongoing under MCH program but now being integrated under CSSM.

Quality of services improved through:

- Supply of additional equipment
- Regular supply of essential drugs
- Retaining of medical and paramedical personnel

New thrust areas are:

- Treatment of ARI
- Newborn care
- Strengthening of emergency obstetric services

CSSM has been phased over a period of 5 years. The implementation of CSSM program was started in 1992–93 in 51 districts and expansion to all districts completed by 1996–97.

In the states like Assam, MP, Odisha, Rajasthan, UP having the high maternal rates, additional inputs were provided to upgrade existing health facilities in the rural areas. FRUs were established in the rural areas of these low performing states under CSSM program.

Q1c. Paradigm shift.

Q1d. How does RCH program differ from CSSM program? (WB[illegible])

Ans: Following the International Conference on Population and Development (ICPD) in 199[illegible] historical reform in family planning, the major policy shift was announced in 1996.

The paradigm shift occurs in RCH, which is different from previous approach of CSSM ([illegible] Safe Motherhood) program. Differences between CSSM program and RCH approach can be [illegible] as follows:

Item	CSSM program	RCH approach
Goal	Two child norm	Enable clients to meet their goals
Approach	Top down, centralized	Bottom up, decentralized
Service	Mainly family planning	Full range of MCH care
Quality	Not cared	High quality
Attitude to client	Motivate, persuade	Listen, assess, need, inform, advice
Performance monitoring	Based on targets	Quality of care, client satisfaction, coverage measures
Accountability	To bureaucracy	To client and community

Q2. What is target free approach? (BNMUB, 2004, 2012)/**Discuss community need assessment (CNA) in RCH.** (BUMP 2018, [illegible])

Ans: Top-down approach was implemented in our country in all kinds of health program where targets of work have been fixed by central health division (top down). This target is sent to the states and the sequence of sending this target is from state to district, district to blocks and block to subcenters. This was not a practical approach. Variation in population structure, education, belief, customs, etc., is present in different districts, blocks and even in subcenters. This top-down approach has been withdrawn in expectation that the target of discrete activities will be prepared by the workers themselves. Health workers plan the services at village level every year and submit subcenter action plans to respective primary health center. The aggregation of village plans lead on to subcenter action plan, aggregation of subcenters action plans constitute primary health center plan and aggregation of PHCs plans lead on to CHCs plan and district action plan is an aggregate of all CHCs plans. **This lifted bottom-up approach is called target free approach.**

The target free approach was experimented in one district each in 18 states, including pilot projects in Kerala and Tamil Nadu during the year 1995-96. Afterwards target free approach was implemented in all the states of the country. After evaluation of the above approach, it was revealed that the term "target free" gives the wrong impression in the mind of the grass root level health workers. To avoid the wrong notion of the term, from 1997 onwards, instead of **"target free" approach a community need assessment (CNA) approach has been accepted.**

RCH phase I (1997-2005) program incorporated the components relating child survival and safe motherhood (CSSM) and included two additional components, one related to sexually transmitted diseases (STD) and other relating to reproductive tract infection (RTI). RCH phase I interventions at district level were as follows:

Interventions in all districts includes:

- Child survival interventions like immunization, vitamin A supplementation, oral rehydration therapy and prevention of deaths due to pneumonia
- Safe motherhood interventions, e.g., antenatal check-ups, immunization for tetanus, safe delivery, anemia control program
- Implementation of target free approach

- High quality training at all levels
- IEC activities
- Specially designed RCH package for urban slums and tribal areas
- RTI/STI clinics at district hospitals (where not available)
- Facility for safe abortions at PHCs by providing equipment, contractual doctors, etc.
- Enhanced community participation through Panchayats, Women's Groups and NGOs
- Adolescent health and reproductive hygiene

Interventions in selected states/districts includes:
- Screening and treatment of RTI/STI at subdivisional level
- Emergency obstetric care at selected FRUs by providing drugs
- Essential obstetric care by providing drugs and PHN/staff nurse at PHCs
- Additional ANM at subcenters in the weak districts for ensuring MCH care
- Improved delivery services and emergency care by providing equipment kits, IUD insertions and ANM kits at subcenters
- Facility of referral transport for pregnant women during emergency to the nearest referral center through Panchayat in weak districts.

RCH phase II began from 1st April 2005. The main focus of this program is to reduce maternal and child morbidity and mortality with the emphasis on rural health care.

Major strategies under RCH phase II are:
- **Essential obstetric care:**
  - Institutional delivery
  - Skilled attendance at delivery
- **Emergency obstetric care:**
  - Operationalizing FRUs
  - Operationalizing PHCs/CHCs for round the clock delivery services
- Strengthening referral system

(WBUHS, 2022)

Janani-Shishu Suraksha Karyakaram (JSSK).
Government of India launched the Janani-Shishu Suraksha Karyakaram (JSSK) on **1st June 2011**, a new national initiative, to make available better health facilities for women and child. The new initiatives provide the following facilities to the pregnant women.
- All pregnant women delivering in public health institutions to have absolutely free and no expense including cesarean section. The settlements include free drugs and consumable, free diet up to 3 days during normal delivery and up to 7 days for C-section, free diagnostics, and free blood wherever required. This initiative would also provide for free transport from home to institution, between facilities in case of a referral and drop back home. Similar entitlement have been put in place for all sick newborns accessing public health institutions for treatment **till 30 days after birth**. The scheme has now been extended to cover the complications during ANC, PNC and also sick infants.
- The scheme is estimated to benefit more than 12 million pregnant women who access government health facilities for their delivery. Moreover, it will motivate those who still choose to deliver at their homes to opt for institutional deliveries.

Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA): It was launched by the MoHFW in **2016**. Under PMSMA, all pregnant women in the country are provided fixed day, free of cost, assured, and quality ANC. The Abhiyan also involves private sector's healthcare providers as volunteers to provide specialist care in government facilities. ANC check-up and free ultrasound tests are done during PMSMA.

Surakshit Matritva Aashwasan (SUMAN): MoHFW launched a new initiative namely SUMAN in **2019** with an aim to provide assured, dignified, respectful, and quality healthcare at no cost and zero tolerance for denial of services for every women and newborn visiting the public health facility in order to end all preventable maternal and newborn deaths and morbidities and provide a positive experience of child birth. The expected

outcome in the new initiative is zero preventable maternal and newborn deaths and high quality of maternal care delivered with dignity and respect.

LaQshya Program: It was launched in **2017** to improve quality care in the labor room and maternity operation theaters in public health facility. The program is evidence-based approach to improve the quality of maternal and newborn care and provide respectful care, particularly during the intrapartum and postpartum periods, which are the most vulnerable periods for a woman and contribute to a significant proportion of maternal deaths. It is being implemented at district hospital, Sub-district hospitals, CHCs with high case load, FRUs and medical colleges. Regional training of trainers have been completed for all states/UTs across country. LaQshya portal has been finalized and operationalized in respect to all LaQshya related data for readily available results also in dashboard.

Q2a. Janani Suraksha Yojana *(AKUB, 2022; ABKUB, 2010; PBDSUHSH, 2013; SSUHSA, 2017, 2018, 2022; DU, 2007; SMU, 2014; NU, 2015, 2016; MUHS, 2019; SDVPG, 2023)*

Ans: The National Maternity Benefit scheme called Janani Suraksha Yojana (JSY). It was launched on 12th April, 2005. The objectives of the scheme are reducing maternal mortality and national mortality through encouraging delivery at health institutions, and focusing at institutional care among women in below poverty line families.

The salient features of Janani Suraksha Yojana are as follows:

A. It is a 100% centrally sponsored scheme.

B. Under National Rural Health Mission, it integrates the benefit of cash assistance with institutional care during antenatal, delivery and immediate postpartum care. This benefit will be given to all women, both rural and urban, belonging to below poverty line household. However, with a view to give special focus in 10 low performing states (states having low institutional delivery rate), namely Uttar Pradesh, Uttarakhand, Madhya Pradesh, Jharkhand, Bihar, Rajasthan, Chhattisgarh, Odisha, Assam and Jammu and Kashmir, **the benefit will be extended up to the third child if the mother, of her own accord, chooses to undergo sterilization in the health facility where she delivered, immediately after delivery**. The other states are called high performing states. The accredited social health activist (ASHA) would work as a link health worker between the poor pregnant women and public sector health institution in the low performing states. ASHA would be responsible for making available institutional antenatal as well as postnatal care. She would also be responsible for escorting the pregnant women to the health center. The scale of assistance under scheme from 2012–2013 would be as follows:

	Rural area			*Urban area*		
Category	*Mother's package*	*ASHA's package**	*Total (₹)*	*Mother's package*	*ASHA's package***	*Total (₹)*
LPS	1,400	600	2,000	1,000	400	1,400
HPS	700	600	1,300	600	400	1,000

(LPS: Low Performing States, HPS: High Performing States)

*ASHA incentive of ₹600/- in rural areas includes ₹300/- for ANC component and ₹300/- for accompanying pregnant woman for institutional delivery.

**ASHA incentive of ₹400/- in urban areas includes ₹200/- for ANC component and ₹200/- for accompanying pregnant woman for institutional delivery.

CM10.4: Describe the reproductive, maternal, newborn, child, adolescent health (RMNCH+A).

Q3. Explain reproductive, maternal, neonatal, child, and adolescent health (RMNCH+A) *(AKUB, 2022; GITAMAP, 2023; SAMU, 2015, 2022; RUJH, 2021; TRIU, 2024)*

Ans: In June 2012, the Government of India, Ethiopia, USA and the UNICEF convened the **"Global Child Survival Call to Action: A Promise to Keep"** summit in Washington, DC to energize the global fight to end preventable child deaths through targeted interventions in effective, life-saving interventions for

children. More than 80 countries gathered at the Call to Action to pledge to reduce child mortality to <20 child deaths per 1,000 live births in every country by 2035. Eight months after the event, in February 2013, the Government of India held its own historic summit on the Call to Action for Child Survival, where it launched "**A Strategic Approach to Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) in India**". Since that time, RMNCH+A has become the heart of the Government of India's flagship public health program, the National Health Mission.

The RMNCH+A strategy is based on provision of comprehensive care through the **five pillars**, or thematic areas, of **reproductive, maternal, neonatal, child, and adolescent health**, and is guided by central tenets of equity, universal care, entitlement, and accountability. The **"plus"** within the strategy focuses on:

- Including adolescence for the first time as a distinct life stage. The health of an adolescent girls also impacts pregnancy while the health of a pregnant women impact the health of newborn and child, so RMNCH+A is a **"Life cycle approach"**
- Linking maternal and child health to reproductive health, family planning, adolescent health, HIV, gender, preconception and prenatal diagnostic techniques
- Linking home and community-based services to facility-based care
- Ensuring linkages, referrals, and counter-referrals between and among health facilities at primary (primary health center), secondary (community health center) and tertiary levels (district levels).

Goals and targets: Taking into account the progress made so far in maternal and child health, it is pertinent to establish the goals and targets for the implementation phase 2012–2017, after considering the main reasons for mortality and interventions proven to have an impact on them.

National goals for RMNCH+A

Indicators	*Current status*	*Goals*
Infant mortality rate/1,000 live births (LB)	28***	28**
Neonatal mortality rate/1,000 (LB)	25*	12.9 ****
Under five mortality rate/1,000 (LB)	42*	25****
Stillbirth rate/Total births	13#	Single digit**
Maternal mortality ratio/1 lakh LB	97***	70****
Full ANC (%) (4 ANCs + IFA +TT)	26*	90**
Institutional deliveries (%)	89*	90**
Fully immunized children (%)	76*	90**
Total fertility	2***	2.1**

Source: NFHS-5*, National Health Policy**, SRS (2020)***, SDG****, HMIS(2017–2020)#

RMNCH+A interventions:

Reproductive health	*Maternal health*	*Newborn health*	*Child health*	*Adolescent health*
• Focus on spacing methods, particularly PPIUDCD at high case load facilities • Focus on interval IUCD at all facilities including subcenters on fixed days • Home deliveries of contraceptives through ASHAs	• Use MCTS to ensure early registration of pregnancy and 4 ANCs • Detect high risk pregnancies and line list of severe anemic mothers and treatment	• Early initiation of EBF • Home-based newborn care through ASHA • Essential newborn care and resuscitation services at all delivery points • Special newborn care units	• Complementary feeding and IFA supplementation • Diarrhea management at community level using ORS and Zinc • Management of pneumonia • Full immunization coverage	• Address teenage pregnancy and increase contraceptive prevalence in adolescents • Introduce community-based services through peer educators • Strengthen ARSH clinics

Contd...

Contd...

Reproductive health	Maternal health	Newborn health	Child health	Adolescent health
• Ensuring access to pregnancy testing kits and strengthening abortion services • Maintaining quality sterilization services	• Equip delivery points with highly trained HR and ensure access to EmOC services through FRUs • Review maternal and infant deaths for collective actions	• Community level use of Gentamycin by ANM	• Screening of children for 4Ds (birth defects, development delays, deficiencies and disease) and its management through RBSK	• Roll out weekly IFA supplementation • Promote menstrual hygiene

(*NB:* EBF: Exclusive breastfeeding; RBSK: Rashtriya Bal Swasthya Karyakram)

RMNCAH+N strategy: Due to the importance of nutrition across all life stages, the strategy now includes nutrition as one of its important pillars. The new strategy thus covers **Reproductive, Maternal, Newborn, Child and Adolescent health plus Nutrition.** Nutrition focuses on linkages between other components like family planning, adolescent health, preconception and prenatal diagnostic techniques, gender and HIV. It also focuses on linkages between community-based services and facility-based services and ensures referrals and counter referrals between various levels of healthcare system to create a continuum of care.

Q4. Outline how the RCH services are provided through different levels of healthcare facilities available in blocks. *(WBUHS, 2013; RGUHS, 2015; ABKUB, 2004; YSRUHSAP, 2023)*

Ans: Provision of services through different level of healthcare facilities:

Through CHC (block level): CHCs are established in our country for every 1,20,000 population at plain area and for every 80,000 population in tribal, hilly and difficult to reach areas. Facilities are available for normal delivery including assisted delivery and cesarean section in upgraded CHC.

- **Basic emergency obstetric care:** Parenteral antibiotics for management of infection; parenteral oxytocics for management of obstructed labor; parenteral anticonvulsants for management of eclampsia; assisted delivery like forceps; manual removal of placenta.
- **Comprehensive emergency obstetric care (available in upgraded CHC):** Basic emergency obstetric care plus blood transfusion, anesthesia and cesarean section.
- **Facilities for abortion:** It is available in all CHCs through manual vacuum aspiration and mifepristone with misoprostol.
- **Essential newborn care:** It comprises resuscitation at birth for birth asphyxia, keeping the baby warm, no bath at birth, prevention of infection, immunization, early initiation of breastfeeding, etc.
- **Emergency newborn care:** For this purpose, sick neonatal stabilization units (SNSU) are established at block level, where the sick newborns are stabilized before referral.
- **Early detection and appropriate management** of acute respiratory infection, diarrhea and other infections, etc.
- **Integrated management of neonatal and childhood illness (IMNCI)** and preservice IMNCI are learned by other grass root level workers like ASHAs.
- **Management of children with malnutrition:** For management of severe acute malnutrition, nutrition rehabilitation centers (NRCs) are established at block level, where the children with severe undernutrition they are admitted for 14–21 days and provided with calorie dense foods using locally available food materials and mothers are counseled to prepare the same food at home so as to maintain the gain in nutritional status of their children.
- **Family planning services:** At least one surgical method of family planning (vasectomy/tubectomy) should be available at block level and facilities for IUD insertion, provision of OCP, condom are available at CHC level.
- **Cold chain maintenance:** There is a separate room for cold chain maintenance at block level, where deep freezers, ILRs, cold boxes and vaccine carriers are available. Temperature of the deep freezer and

ILR are monitored twice daily by PHN. Vaccines are transported from this room to different outreach sessions.

- **Adolescent health:** Anwesha clinics are established at block level, where counseling is done thrice in a week by Anwesha counselor for various medical and social problems, if necessary, they are referred to medical officers. Different services under ARSH are also available at block level which includes nutrition and health education, counseling about general issues of ARSH, IFA tablet supplementation, school health services, management of menstrual problems, sexual abuse, RTI/STI, etc., and outreach services.
- **Through PHCs:** These are established in our country for every 30,000 population at plain area and for every 20,000 population in tribal, hilly and difficult to reach areas. Facilities are available for normal delivery.
- **Facilities for abortion:** It is available in selected PHCs through manual vacuum aspiration and mifepristone with misoprostol.
- **Essential newborn care:** It comprises resuscitation at birth for birth asphyxia, keeping the baby warm, no bath at birth, prevention of infection, immunization, early initiation of breastfeeding, etc.
- **Emergency newborn care:** For this purpose, newborn care corners are established at PHC level, where the sick newborns are stabilized before referral.
- **Early detection and appropriate management** of acute respiratory infection, diarrhea and other infections are other services which are provided from PHCs.
- **Integrated management of neonatal and childhood illness (IMNCI)** and preservice IMNCI learned by ASHAs, other grass root level worker.
- **Through subcenters:** Subcenters are established in our country for every 5,000 population at plain area and for every 3,000 population in tribal, hilly and difficult to reach areas. Different services under RCH at subcenter level are present. Early registration of pregnancy is done at this level.
- **Provision of minimum four antenatal check-ups:** During every check-up following physical examination and laboratory investigations should be done thoroughly.
- **Physical examination:** Height, weight, pulse, blood pressure, pallor, edema, jaundice, fundal height, fetal movement and fetal heart sound (done in advanced pregnancy) are examined.
- **Laboratory examination:** Blood for CBC (Hemoglobin), sugar, urine-sugar, albumin, if facilities available, are following investigations can be done once. Blood grouping and Rh typing, blood-VDRL, HIV 1 and HIV 2 are asked to do from **the designated service centers**.
- **Other services:** Universal coverage of all pregnant women with IFA supplementation and TT immunization are expected. Advice on food, nutrition and rest is given. Detection of high-risk pregnancies and prompt referral are key activities to save mothers. Promotion of institutional deliveries and clean deliveries by trained personnel are promoted to save both mother and child. Normal delivery facilities are available in selected subcenters also.
  - Advice on birth spacing is a sensitive issue and it is acceptable at this time.
  - Provisions of at least three postnatal check-ups are recommended.
- **Immunization services:** Outreach sessions are conducted at subcenters and AWCs (as a part of VHND). Vaccines are transported from CHC/PHC through vaccine carriers and different vaccines are administered to eligible children and pregnant mother.
- **Family planning services:** Condom and OCP are available at subcenter and referral for IUD insertion for target couples and also referral adolescent health services where available.

Q5a. What do you mean by antenatal care, the objectives and components of antenatal care? *(WBUHS, 2017, 2020, 2021; BNMUB, 2012; TRIU, 2013; SMU, 2012, 2014; RGUHS, 2011, 2013; YSRUHSAP, 2017; TDMGRMU, 2014)*

Q5b. Describe briefly the RCH package of services for pregnant lady. *(BNMUB, 2005)*

Q5c. A pregnant women of 22 weeks gestation having anemia has come for antenatal checkup. Write in brief how you will manage the case to ensure safe delivery. What are the schemes she is entitled for her safe delivery? *(SSUHSA, 2015)*

Q5d. **Describe antenatal care and antenatal checkups during pregnancy. Who are the risk group mothers for pregnancy, what are the danger signals of pregnancy?** *(WBUHS, 2017; BNMUB, 2017)* **/A pregnant women has reported first time in a subcenter for an antenatal checkup upon 20th week.** *(WBUHS, 2016)*

Q5e. **A recently delivered (2 weeks back) mother has come for checkup. Discuss the components of postnatal checkup. What might be the postnatal complications, what measures can be taken to improve postnatal (prevent neonatal mortality) care at community level?** *(WBUHS, 2018; SMU, 2012)*

Ans: **Antenatal care** starts after conception and continue throughout pregnancy. The meaning of antenatal care is to achieve at the end of a pregnancy a healthy mother and healthy baby.

The objectives of antenatal care are:

- To promote, protect and maintain the health of mother during pregnancy
- To foresee complications and prevent them
- To remove anxiety and fear associated with delivery
- To reduce maternal and infant mortality and morbidity
- To aware mother about elements of childcare, nutrition, personal hygiene and environmental sanitation
- To sensitize them to the need for family planning and advice to cases seeking medical termination of pregnancy
- To attend to the under-fives clinics accompanying the mother

Antenatal period: From conception to true labor pain.
Intranatal period: From true labor pain to delivery of fetus and placenta.
Postnatal period: From delivery of fetus and placenta to 42 days after delivery.
Antenatal check-ups during pregnancy: Minimum four antenatal check-ups are essential. During every check-up the following physical examination and laboratory investigations should be done thoroughly.

- **1st visit**—within 12 weeks, preferably as soon as the pregnancy is confirmed then registration done (early registration)
- **2nd visit**—between 14 and 26 weeks
- **3rd visit**—between 28 and 34 weeks
- **4th visit**—between 36 weeks to term

Danger signals during antenatal period are bleeding per vagina, blurring of vision, convulsions, loss of fetal movement, severe headache and giddiness, any other unusual symptoms.

Danger signals during natal period. *(SAMU, 2015; KIMS, 2019)*
Sluggish pains or no pains after rupture of membranes, good pains for an hour after rupture of membranes but no progress, prolapsed of hand or cord, mal-presentations like breech, face, oblique lie, etc., meconium stained liquor, abnormal fetal heart sound (slow or fast), excessive show or bleeding during labor, collapse during labor, retained placenta, postpartum hemorrhage or collapse and high temperature (38°C or over) during labor.

Components of postnatal checkups are fall under two broad headings:

A. **Care of mother:**
   - Restoration of mother to optimum health—postnatal examinations, anemia, nutrition, postnatal exercises, psychological care, prevent complications
   - Adequacy of breastfeeding
   - Family planning services—use of contraceptives—IUD and conventional nonhormonal contraceptives
   - Basic health education to mother and family—personal hygiene, feeding of mother examination of breast, involution of uterus, lochia, inspection of perineal/abdominal stitch area, asking about bladder bowl habit also should be done as a routine procedure
   - Importance of health check-up and birth registrations

B. **Care of newborn:**
   - Care of airway and maintenance of cardiorespiratory functions, care of cord, eyes and skin
   - Maintenance of body temperature

- Avoidance of infections
- Satisfactory breastfeeding
- Early detection and treatment of congenital and acquired disorders specially infections

The most common postnatal complications are:

- Puerperal sepsis
- Postpartum hemorrhage
- Urinary tract infections
- Mastitis
- Thrombophlebitis, etc.

The components of antenatal care are:

- Antenatal registration
- Antenatal history
- Antenatal examination
- Antenatal investigation
- Antenatal advice
- Antenatal services

Antenatal registration: Registration of mother is done in the antenatal register after confirming the pregnancy clinically in the hospital and after 12 weeks of missing period. Pregnancy test is also done to confirm the doubt of pregnancy. The relevant information like registration number, expected date of delivery (EDD), previous and present health as well as obstetrical and gynecological history, present complaints noted down in mother and child card. The card also contain areas for noting down the weight of mother, recording of blood pressure, number of visits by mother, TT immunization, distribution of IFA tablets. The card also helps in enumeration of mothers and pregnancy outcome as well as calculation of maternal and infant mortality. Thus, helps in evaluation of existing MCH services.

Antenatal history: Gynecological history: Age at menarche, history of menstrual cycles, last menstrual period (LMP) for calculating the EDD.

EDD = 1st day of last menstrual period to 9 calendar months and 7 days.

Examples: If LMP was 02.02.2015, then EDD will be 09.11.2015.

Obstetric history: Age at marriage, duration of married life, age at 1st pregnancy and details history of previous pregnancies and deliveries, including gravida status (order of pregnancy), parity status (number of viable deliveries), abortions, stillbirths, number of living children, number of dead children and their causes.

Antenatal examinations:

- **Physical examination:** Built, nourishment, anemia, edema, BP, height and position of nipple are examined. Examination of mother is incomplete without examination of the breast.
- **Systemic examination:** It includes examination of various systems like central nervous system, cerebrovascular system, respiratory system, alimentary system and genitourinary system to find out systemic disease if any.
- **Abdominal examination:** It is done to monitor the progress of pregnancy, fetal growth, presentation or fetal lie and fetal heart sound.
- **Pelvic examination:** It is in last check up to exclude cephalopelvic disproportion.

Antenatal investigation: Blood for CBC (hemoglobin), blood grouping and Rh typing, Fasting blood glucose, VDRL, HIV (1 and 2), hepatitis-B, malaria, urine for albumin and sugar, stool for ova, parasite and cyst and other investigation like ECG, echocardiogram, scanning if facilities are available **(Fig. 10.1)**.

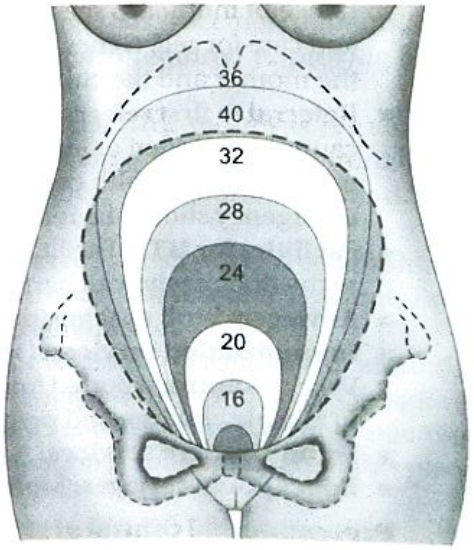


Fig. 10.1: Uterine fundal height.

Prenatal diagnosis for congenital anomalies: Alpha-fetoprotein, ultrasound, nuchal translucency scan, amniocentesis.

Antenatal advice:

- **Advice on nutrition:** No restriction of diet usually one extra meal should be advised. Mother should consume more green leafy vegetable. Mother should gain weight 10–12 kg in pregnancy.
- **Advice on personal hygiene:** Daily bath will be continued. Maintenance of oral hygiene is advised. Mother should wear clean, light and loose cloths.
- **Advice on rest and sleep:** Two hours sleep after lunch and 8 hours sleep during night are advised.
- **Advice on exercise:** Light household work can be continued. Morning and evening walking is preferred. Heavy weightlifting is avoided.
- **Advice on drugs:** Self-medication is to be avoided. Mother should take medicine as per advice of consulting physician.
- **Advice on drugs and X-ray:** Drugs must be avoided like Tetracycline, Doxycycline, Steroids, LSD, Streptomycin, Thalidomide, etc. X-ray should be avoided unless indicated because it causes radiation hazards.
- **Advice on personal habits:** Alcohol and smoking should be avoided during pregnancy, hence, harmful for the fetus.
- **Advice on sexual relation:** Restricted during first and last trimester and strictly prohibited if there is history of miscarriage or premature delivery.
- **Advice on warning signs:** Warning signs are bleeding per vagina, blurring of vision, convulsions, loss of fetal movement, severe headache, giddiness and any other unusual symptoms.

Antenatal services:

- **Nutritional services:** Daily supplementary food through ICDS program.
- **Immunization services** like Td, Hepatitis B, German measles, Erythroblastosis fetalis, some vaccines are considered as per current situation.
- **Medical services:** IFA, Anti-helminthic and use of Inj. Penicillin in VDRL positive cases with caution.
- **Other services:** Universal coverage of all pregnant women with IFA supplementation and Td immunization are expected. Advice on food, nutrition and rest is given. Detection of high-risk pregnancies and prompt referral are key activities to save mothers.
- **Institutional deliveries and deliveries by skilled birth attendants:** Promotion of institutional deliveries and clean deliveries by trained personnel are promoted to save both mother and child.
- **Home-based postnatal care:** Delivery may occur at home. The health worker and ASHAs will visit the house of mother to see the newborn baby and mother for helping her breastfeed the baby, care of child and care for self. Generally, the visit is given on 0, 3, 7, 14, 21, 28, 42 days during puerperal period for both the mother and the child. Provisions of at least three postnatal check-ups are essentially recommended.
- **Referral to first referral units (FRU) for obstetric emergencies:** Mother may face complication(s) which cannot be tackled at lower-level health care facility. She may need cesarean section, blood transfusion, monitoring of health condition(s), etc. The services can be provided from FRU and thus the mothers in emergency should be referred to this upper tier health facility.
- **Facilities for MTP:** Facilities for MTP are present in primary healthcare system. In need they will be referred to the doctor who can perform MTP in their set up.
- **Advice** on birth spacing is a sensitive issue and it is acceptable at this time.
- **Immunization services:** Outreach sessions are conducted at subcenters and AWCs (as a part of VHND). Vaccines are transported from CHC/PHC through vaccine carriers and different vaccines are administered to eligible children and pregnant mother.
- **Family welfare services:** Advice for IUD and other contraceptives through cafeteria choice.
- **Educational services:** Mothers are advised about referral services and childcare practices.

Prevention and control of infant mortality: Before taking measures for improvement of postnatal situation in the community, some other issues will be looked for. Proper planning is a priority to accomplish the

desired objectives followed by implementation, monitoring and evaluation. Following steps will be followed for reduction of IMR **(By BMOH):**

A. **Situation analysis:**
- *Identification of the magnitude of the problem:* It can be measured by: I. House to house survey: It will be time consuming and troublesome. II. Records from registers of SC, PHC and BPHC: This method will be easier to collect data on neonatal and post neonatal death. III. Hospital records: The record will not provide full information. The magnitude will help the administrator to allocate resources. Age, sex, caste, geography, health service situation, etc., will be noted to address the problem.
- *Identification of postnatal cause of child:*

Medical causes:
- *Neonatal mortality:* The causes of death in neonatal period can be ascertained from the data. The causes may be low birth weight, birth injury, sepsis, birth asphyxia, hemolytic disease of the newborn, neonatal tetanus, ARI, diarrhea singly or in combination.
- *Postneonatal mortality:* The causes of death during postneonatal period of infancy may be singly or in combination of any of the following conditions. They are ARI, diarrhea, other communicable diseases, malnutrition, accidents, malignancy, etc.
- *Social causes:* These are indirect causes of childhood mortality. These also should be addressed. The social causes are early marriage, teenage pregnancy, two close pregnancies, too many pregnancies, poverty, illiteracy, ignorance, quality of mother craft, broken families, lack of trained manpower, lack of transport facilities, poor utilization of healthcare delivery system, faulty feeding practices, brutal habits, etc.

B. **Setting objectives and goals:** Objective should be prefixed to achieve by a specific period of time. High IMR is not so specific to fix up the objectives in comparison with district or state or country figure. As per problem, it can be said that at the end of all activities BMOH will be able to reduce the postnatal death by 50% in this block within one year.

C. **Identification of resources:** Resources should be assessed with a balance of what is required and what is available. Resources can be divided into manpower, money and material.
- *Manpower:* BMOH/MO-IC, Medical Officers, Block Public Health Nurse (BPHN), Public Health Nurse (PHN), Laboratory Technicians, Health Supervisors, Multipurpose Health Workers (female), Second Auxiliary Nurse Midwifery (ANM) are government functionaries. ASHA, Anganwadi Worker (AWW), CHG, Link workers are few voluntary workers who work for people's health. Their strength should be assessed for proper and smooth functioning in the affected area.
- *Material:* Necessary drugs like Cotrimoxazole tablet, Zinc tablet, IFA tablet (small), ORS, injectable antibiotics, albendazole, etc., are very important material to treat medical problem of infants. IV fluid, saline set, weight machine, growth chart, etc., are other supportive materials. Vaccines, diluents, auto-disable and disposable syringe, health education material, etc., are also required to provide health services to young children. These also should be assessed.
- *Money (Finance):* Money is required to discharge all kinds of services. This money is required for the implementation of different strategies. If required, extra-money should be requested from higher authority. Contingency money is present to the custody of block office. That money will be utilized during the provision of delivery of the health services.

D. **Fixing priorities:** After problems identified by situation analysis, resource assessment and establishment of objectives, priority action should be chosen. Because problems are many but resource is scarce. From different problems one or two problems will be taken for action implementation.

E. **Plan formulation:** Preparation of detailed plan(s) in all respects for the execution of a project for all kind of activities to reduce mortality of neonates will be made. Expected outcome objectives should be considered during planning. It might include maternal care, newborn care, childcare in respect of feeding, weaning, vaccination, etc. Each activity will be monitored and ultimately evaluation should be a part of this plan.

F. **Implementation strategies of the program:**
- *Strengthening of antenatal care* will be done particularly targeting SC, ST, BPL, tribal and other underprivileged group of population. Following measures should be adopted during antenatal period—

early registration, at least 4 antenatal check-up, IFA supplementation, TT immunization, advice on diet and rest, identification of high-risk pregnancies and prompt referral, promotion of family planning. The population group and area will be chosen from situation analysis.

- *Provision of deliveries by trained personnel* by maintaining clean procedure (7Cs).
- *Strengthening essential newborn care:* Components of essential newborn care are establishment of cardiorespiratory system, prevention of infection, prevention of hypothermia and establishment of feeding practice.
- *Provision of home-based newborn care* on 3, 7, 14, 21, 28, 90 days by ASHA, ANM, etc., in case of home delivery, one extra visit is paid on day 1.
- *Providing emergency newborn care* through Sick Neonatal Stabilization Unit, at sick newborn care unit, etc., developed at BPHC/CHC/RH.
- *Improving quality and coverage of immunization services* by regularly conducting fixed and outreach sessions at subcenter by ANM, ASHA and AWW and this can be augmented through Village Health and Nutrition Day.
- *Appropriate management of ARI and diarrhea:* Severe pneumonia cases are managed with IV antibiotics like injection chloramphenicol and pneumonia cases are managed with cotrimoxazole tablets. Diarrhea with severe dehydration cases are managed with IV fluids like normal saline or ringer lactate. Diarrhea with some dehydration cases are managed with ORS (75 mL/kg for 4 hours). Diarrhea with no dehydration cases are managed at home with ORS and home available fluids. Zinc is introduced in the treatment of diarrhea for reducing the severity and duration of diarrhea. Antibiotic is indicated in case of dysentery and cholera. This can prevent death of diarrhea and pneumonia.
- *Establishment of nutritional rehabilitation center (NRC):* It should be established at the block level where severe underweight cases with certain indications (visible severe wasting, edema, mid arm circumference <11.5 cm, etc.) are admitted for 14–21 days and receive appropriate feeding regimen. Treatment is divided into stabilization, transition and recovery phase. During the treatment period mother is trained for preparation of food at home.
- *Providing the benefits of Janani Shishu Suraksha Karyakram (JSSK)* to the neonates like free transport, free drugs and consumable, free diagnostic facilities, etc.
- *Training of different categories of staffs:* Medical officers and nurses should receive training about essential and emergency newborn care, F-IMNCI, etc. ANM, ASHA, AWW should be trained about classification and management protocol of IMNCI, essential newborn care, etc. Training will improve quality and coverage of services.
- *IEC:* It can be implemented through interpersonal, group approach and mass media. Doctors, nurses, BPHN, PHN, health supervisor, ANM, AWW can perform the role of health educator. **Content of IEC** will include infant and young child feeding practices, prevention of ARI and diarrhea, home management of ARI and diarrhea, importance of regular growth monitoring, usefulness of immunization, etc.
- *Community participation:* By involving ASHA, AWW, CHG, panchayat leader, local leader, etc., program can be made successful.
- *Intersectoral coordination* with panchayat, education dept, NGO, ICDS, etc. Following strategies are implemented by above mentioned strategies through different levels of healthcare delivery system and using different categories of manpower.

G. **Monitoring**

H. **Evaluation**

I. **Conclusion:** This last step will tell us whether the activities have achieved our objectives. If mortality of postnatal child be reduced by these activities the program will be continued. If it did not work in the expected level, objectives will be reformulated and accordingly plan will be revisited and implemented. In this way, we will be able to take action to reduce the postnatal mortality in that community.

Q6. Briefly enumerate the specific health protective measures in antenatal care. *(BNMUB, 2006; RGUHS, 2013; GNSUB, 2023)*

Ans: **The specific health protective measures in ANC are as follows:**

1. Antenatal investigation
2. Prenatal diagnosis for congenital anomalies

Antenatal advice

- On nutrition
- On personal hygiene
- On rest and sleep
- On exercise
- On drugs and X-ray
- On personal habits
- On sexual relation
- On warning signs

Antenatal services

- Nutritional services
- Medical services
- Family welfare services
- Educational services

Elaborate the answer from previous Q.5

Q7. What do you mean by essential obstetric care? What are the services delivered under essential obstetric care according to RCH-II program? *(WBUHS, 2015; GNSUB, 2022; BNMUB, 2005; ABKUB, 2023; DU, 2015; SAMU, 2022; RGUHS, 2008; TRIU, 2013; TDMGRMU, 2010; NU, 2016; RUJH, 2022; GNSUB, 2023)*

Ans: Essential obstetric care is an essential strategy for improving maternal or child health and reduction of maternal and child mortality. This intends to provide the basic maternity services to all pregnant women.

The components of essential obstetric care are as follows:

- Early registration of pregnancy
- Provision of minimum four antenatal check up
- Universal coverage of all pregnant women with IFA supplementation and TT immunization
- Advice on food, nutrition, rest
- Detection of high-risk pregnancies and prompt referral
- Promotion of institutional deliveries and clean deliveries by trained personnel
- Advice on birth spacing
- Provision of at least three postnatal check-up

Elaborate the answer from Q.5.

Q7a. Birth preparedness and complication readiness. *(WBUHS, 2024)*

Ans: Birth preparedness and complication readiness have five intervention components: Identifying the place of the delivery, skilled birth attendant, blood donor, and means of transport during an emergency case as well as saving money that can be used during an emergency.

This approach includes identifying a health facility for emergency, trained birth attendant for delivery, attainment of sterile/clean materials (blade, soap, cord ties, clean linen), saving money for delivery, arranging transportation to a facility, and planning for referral if needed and also ensure women to be accompanied with pregnant mother.

Components of birth preparedness and complication readiness plan includes; identifying a place of delivery, saving money, preparing essential items for childbirth, identifying a skilled provider, identifying a mode of transportation, arranging blood donors, arranging a way for communication, designating decision make BPCR is measured by various key elements including arrangement for transportation, saving money

for delivery, identifying skilled birth attendant, identifying place of delivery and identifying blood donor in the case of emergency, knowledge regarding danger signs during pregnancy, labor, postpartum and newborn.

Birth preparedness and complication readiness (BPCR) interventions to reduce maternal and neonatal mortality in developing countries.

Q8. What do you mean by RCH? A subcenter has a population of 6000. How many pregnant women will be there for one year? How will you provide essential obstetric care for all pregnant women in the area? *(BNMUB, 2008)*

Ans: Reproductive and child health (RCH) can be described as "people have the ability to reproduce and regulate their fertility, women are able to go through pregnancy and childbirth safely, the outcome of the pregnancies is successful in terms of maternal and infant survival and well-being and couples are able to have sexual relations free of fear of pregnancy and contracting disease."

Crude birth rate in India (2012) is 21.6/1000 population (Census of India 2011). As some pregnancies may not result in a live birth (i.e., abortion and stillbirth may occur), the expected number of live birth would be an under estimation of the total number of pregnancies. So correction factor (pregnancy wastage) of 10% is added to the expected number of live birth. Expected number of live birth/year = 21.6 × 6,000/1,000 = 129.6 (130)

Pregnancy wastage = 10% of 129.6 = 12.96 (13)

Expected total pregnant women in one year will be = 130 + 13 = **143 in area of general population 6,000.**

Essential obstetric care is an essential strategy for improving maternal or child health and reduction in maternal and child mortality. This intends to provide the basic maternity services to all pregnant women.

For 1000 population, 6 ASHAS and AWWs are present. Expected no. of pregnant women in each 1000 population will be about 20–25. They both find out pregnant mother in their working area and sharing information among them to reach the exact number. Apart from that few pregnant women come from other area they also need services, should be included in the list and regularly updated.

ANM of the area exclusively worked one day for pregnant women provided services as per norms in outreach clinics with help from AWW and ASHA, pregnant women are gathered to receive necessary services closed their resident.

Again in 4th Saturday meeting, convergence of activity regarding pregnant women and subsequent upgradation of Eligible Couple Child Register (ECCR) is discussed and done. If any complicated pregnant women identified immediately referred to FRU for care. Whenever pregnant women visited the health center above mentioned activities will be performed with the available resources and action should be taken as per norms.

Q9. What are the different maternal health problems in India? *(WBUHS, 202)*

Ans: Maternal health problems in India are concern with the triad of **malnutrition, infection** and **unregulated fertility**. India's primary concern is to reduce maternal and child mortality and morbidity, spacing, limitation of family size, prevention of communicable diseases, improvement of nutrition and acceptance of available health services.

The adverse effect of **malnutrition** are low birth weight, anemia, toxemias of pregnancy and postpartum hemorrhage, maternal **infection** leads to low birth weight, abortion, puerperal sepsis. Many women infected with HIV, hepatitis B, cytomegalovirus, herpes simplex virus, toxoplasma and sometimes urinary tract infection. **Unregulated fertility** may leads to low birth weight, severe anemia, abortion, antepartum hemorrhage along with perinatal mortality.

Q10. What are the indications of MCH care? Discuss the maternal mortality. Write the causes and factors related to maternal mortality. *(BNMUB, 2015; TDMGRMU, 2017)*

Q10a. Define maternal mortality ratio. Enumerate important medical causes and factors (social) related to maternal mortality. Discuss in brief the measures to prevent and control such deaths in rural community. *(WBUHS, 2022; AFUH, 2022; BNMUB, 2011; ABKUB, 2017; VKSUAB, 2021; RGUHS, 2012; TRIU, 2016; SSUHSA, 2022; SAMU, 2007, 2010, 2022; TDMGRMU, 2013; KIMS, 2015, 2021, 2022, 2023; SMU, 2011; NU, 2015, 2016; TRIU, 2016; MU, 2022; SDVPG, 2023; AKUB, 2023)*

Q10b. What are the common causes of maternal deaths in our country? How will you prevent its occurrence? *(BNMUB, 2018, 2019, 2020; SSUHSA, 2017, 2021, 2023; BUMP, 2012; DU, 2014; NU, 2017)*

Q10c. Maternal mortality rate is 7 per 1,000 live birth in your block. Suggest measure for reduction of MMR. *(WBUHS, 2008)*

Q10d. Maternal mortality ratio in your block is found persistently high. As a BMOH, outline the (a) investigation procedure to find out the causes of maternal mortality (b) intervention to be adopted to reduce the MMR. *(WBUHS, 2013; BNMUB, 2023)*

Q10e. As a medical officer, what measures will you adopt to reduce maternal mortality? *(WBUHS, 2018, 2019)*

Q10f. How will you reduce maternal mortality in India? *(BNMUB, 2015)*

Ans: The indicators of MCH care are as follows:

1. Maternal mortality rate and maternal mortality ratio
2. Neonatal mortality rate
3. Perinatal mortality rate
4. Postneonatal mortality rate
5. Infant mortality rate
6. 1-4 years mortality rate
7. Under five mortality rate

Q10g. Define maternal mortality ratio and maternal mortality rate. *(WBUHS, 2014; ABKUB, 2008; BNMUB, 2017; RGUHS, 2012, 2013; TRIU, 2015, 2016; SSUHSA, 2007; RUJH, 2022)*/**What is maternal mortality ratio? How does it differ from maternal mortality rate?** *(WBUHS, 2018, 2019; GOAU, 2021; KIMS, 2023; VNSGUS, 2023; SDVPG, 2023)*

Ans: From the following equations, they can be easily assessed, interpreted.

$$\textbf{Maternal mortality ratio} = \frac{\text{Total no. of female deaths due to complications of pregnancy, childbirth or within 42 days of delivery from puerperal causes in an area during a given year}}{\text{Total number of live birth in the same area during the year}} \times \mathbf{100000}$$

$$\textbf{Maternal mortality rate} = \frac{\text{Total no. of female deaths due to complications of pregnancy, childbirth or within 42 days of delivery from puerperal causes in an area during a given year}}{\text{Total number of women of 15–49 years in the same year during the year}} \times \mathbf{100000}$$

Justification: Denominator includes numerator in rate but not in ratio. Live births are babies which are not part of mothers. Women of 15–49 years include mothers who died. So, we can easily conclude that maternal mortality ratio and maternal mortality rate are not same.

Maternal mortality ratio (MMR):

MMR	2014–16	2015–17	2016–18	2017–19	2018–20
India Total	130	122	113	103	97

Source: SRS (18–20)

Maternal mortality rate: This is not available in India. This is not practiced at all. Actually maternal mortality ratio is synonymously used as maternal mortality Rate. Whenever we say maternal mortality rate, actually we mean maternal mortality ratio.

Perinatal mortality rate (PMR): The term 'perinatal' death includes late fetal death and early neonatal death. It is starting from 28th week of gestation to the 7th day after birth.

The WHO's definition, more appropriate in nations with **well-established** vital records of stillbirth, is as

$$\text{PMR} = \frac{\text{Late fetal death + Early neonatal death in one year}}{\text{Live birth + Late fetal deaths in the same year}} \times \mathbf{1000}$$

WHO definition, more appropriate in nations with **less well-established** vital records of stillbirth, is as follows:

$$\text{PMR} = \frac{\text{Late fetal death + Early neonatal death in one year}}{\text{Live birth in the same year}} \times \mathbf{1000}$$

Neonatal mortality rate (NMR): Neonatal deaths are deaths occurring during neonatal period, commencing at birth and ending 28 completed days after birth. Neonatal mortality rate is the number of neonatal death in a given year per thousand live births. It can be expressed by the following formula:

$$\textbf{NMR} = \frac{\text{No. of death of children under 28 days of age in a year}}{\text{Total live birth in the same year}} \times \mathbf{1000}$$

Important causes of NMR are low birth weight, birth asphyxia, neonatal tetanus, birth injury and difficult labor, sepsis, hemolytic disease of the newborn, diarrheal diseases, ARI, etc.

Postneonatal mortality rate: Deaths occurring from 28 days of life to under 1 year are called postneonatal deaths, it can be expressed as:

$$\text{Postneonatal mortality rate} = \frac{\text{Number of death of children between 28 days and 1 year of age in a given year}}{\text{Number of live birth in the same year}} \times \mathbf{1000}$$

Causes of postneonatal mortality are ARI, diarrhea, other communicable diseases, malnutrition, accident etc.

Infant mortality rate (IMR): It is defined as 'the ratio of infant deaths registered in a given year to the total number of live births registered in the same year, usually expressed as a rate per 1000 live births. It is given by the following formula:

$$\textbf{IMR} = \frac{\text{Number of death of children less than 1 year of age in a year}}{\text{Number of live birth in the same year}} \times \mathbf{1000}$$

1–4 years mortality rate (child death rate): Child death rate is the number of death of children aged 1–4 years per 1000 live births in the same age in a given year. It thus excludes infant mortality. The rate is computed by the following formula:

$$\textbf{1–4 years mortality rate} = \frac{\text{No. of death of children aged 1–4 years during a year}}{\text{Total no. of children aged 1–4 years at the middle of the year}} \times \mathbf{1000}$$

Under-5 mortality rate (child mortality rate): Annual number of death of children aged under 5 years expressed as a rate per 1000 live births. The rate is calculated by the following formula:

$$\textbf{Under-5 mortality rate} = \frac{\text{No. of death of children less than 5 years of age in a given year}}{\text{Number of live birth in the same year}} \times \mathbf{1000}$$

Maternal mortality: According to WHO, a maternal death is defined as **"the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management but not from unintentional or incidental causes".**

Medical causes of maternal mortality:

A. **Obstetric causes:**
1. Hemorrhage (Antepartum/Postpartum)
2. Infection
3. Preeclampsia/eclampsia
4. Obstructed labor
5. Unsafe abortion

B. **Nonobstetric causes:**
1. Anemia
2. Cardiac, renal, hepatic and metabolic diseases
3. Malignancy
4. Accident

(RGUHS, 2024)

Factors (social) related to maternal mortality:
1. Too early, too close and too many pregnancies
2. Poor socioeconomic status
3. Illiteracy, ignorance and prejudices
4. Malnutrition
5. Lack of access to skilled birth attendant and emergency obstetric care
6. Social delay (Type-1, 2 and 3 delay)
7. Lack of male participation
8. Poor implementation of maternity benefit scheme
9. Inadequate, ill-equipped healthcare delivery system

There are 3 (three) important strategies for reduction of maternal mortality in the county like India.
1. Essential obstetric care for all
2. Early detection of complications
3. Emergency services for those who need it

Measures to prevent and control maternal deaths in rural community/India *(AFUH, 2023)*

Investigation procedures:

A. **Situation analysis:**
- Measuring the magnitude of the problem by reviewing hospital records, house to house survey by community based maternal death review
- Reporting and reviewing of all maternal deaths by BMOH
- Verification/confirmation of maternal deaths

Find out the important causes: Time, place and person distribution of all maternal deaths.

Time distribution: Antepartrum/intrapartum/postpartum, morning/night, time interval between onset of symptoms and death, time interval between admission in hospital and death.

Place distribution: Place of delivery, place of residence, place of death (at home/institution), which type of institution (PHC/CHC/District hospital/Medical college, etc.)

Person distribution: Age, parity, education, socioeconomic status, etc.

B. **Fixing objectives**

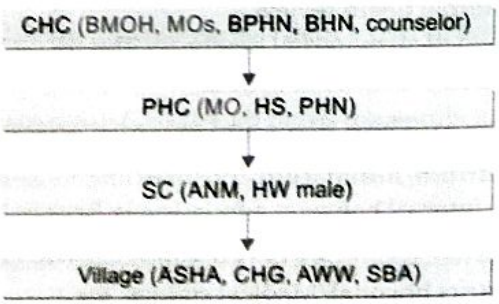
C. **Identification of resources: Manpower, material and money (Finance)**

D. **Fixing priorities**

E. **Plan formulation**

F. **Implementation of strategies:**

- All CHCs and 50% PHCs should be operationalized to provide 24 hours services. There should be provision of basic emergency obstetric care in such facilities.
  Components of basic emergency obstetric care are parenteral antibiotics, parenteral oxytocic, parenteral anticonvulsant, manual removal of placenta and assisted delivery.
- **Training MBBS MOs** in anesthetic skills and basic, emergency obstetric care.
- **Providing emergency obstetric care services to BPL families** at recognized private facilities according to Ayushmati scheme at free of cost.
- **Equipping subcenters for normal delivery:** Many beneficiaries cannot reach to the PHC/CHC due to geographical inaccessibility. So, a well-equipped subcenter is a better option for normal delivery. These subcenters should have the basic amenities like electricity and water supply and ANMSs should be adequately trained.
- **Promote deliveries by skilled birth attendants (SBAs)** in the community.
- **Permit ANMs to administer obstetric first aid:** They should be permitted to use inj Oxytocin, inj Magnesium sulphate, inj Gentamicin, oral Ampicillin, oral Metronidazole, oral Misoprostol as they need to manage the complications like eclampsia, sepsis, obstructed labor in rural community. They are also permitted to use IV drip.
- **Improve coverage and quality of antenatal care** by targeting BPL, SC, ST, tribal people and other marginalized group in the rural community.
- **Provision of free transport facility** according to Matriyan Scheme because many people cannot reach to the designated health center, because of lack of transport facility. According to these scheme, free transport facility is available in case of obstetric emergencies from home to health center, health center to higher center and higher center to home.
- **Promotion of safe MTP services at all CHCs and at least 50% PHCs:** Unsafe abortion is an important cause of MMR. So, there should be facility of manual vacuum aspiration/mifepristone with misoprostol in all CHCs and 50% of the PHCs.
- **Timely providing the benefits of Janani Suraksha Yojana (JSY)** to the eligible beneficiaries for institutional delivery.
- **Strengthening facility-based and community-based maternal death** review for identification of causes and related factors in each maternal death.
- **Provision of home-based postpartum care** at 3, 7, 14, 21, 28, 42 days after delivery by ASHA, ANM for early detection and referral of any complications in the postpartum period.
- Intersectoral coordination by involving panchayat, NGO, ICDS, etc.
- BMOH should implement the above mentioned strategies through following level of healthcare delivery system and using different categories of manpowers.



G. **Monitoring**

H. **Evaluation**

I. **Conclusion:** This last step will tell us whether the activities have achieved our objectives. If mortality of infant be reduced by these activities the program will be continued. If it did not work in the expected level

objectives will be reformulated and accordingly plan will be revisited and implemented. In this way, we will be able to take action to reduce the mortality of infants in that community.

What are the five cleans to be provided during intranatal period? How will you prevent neonatal tetanus? *(BNMUB, 2002)*/**Few cases of NNT has been reported from a Block of a District, as a BMOH what measure will you take to prevent its further occurrence?** *(WBUHS, 2008)*

A 7-day-old baby is brought to your OPD block with excessive cry, refusal of feeds and convulsions, discuss the diagnosis, case management and prevention strategies as per national immunization program? *(WBUHS, 2010; GITAMAP, 2023; RUJH, 2013; ABKUB, 2017)*

Childbirth is a normal physiological process. Septicemia may result from unskilled and septic manipulation and tetanus neonatorum from the use of unsterilized instruments. So effective intranatal care based on cleanliness is essentially required. Hospitals and health center equipped with midwifery kits for aseptic delivery are right places for cleanliness.

- Clean hands and fingernails
- Clean surface for delivery
- Clean razor blade
- Clean ligature
- Clean cord stump

Another 2 (two) clean added now, that are clean water and clean towel

To observe above five cleans, during last antenatal checkup, a disposable delivery kit (DDK) is provided to mother by health worker with an objective to open it at the time of delivery. By observing 5 cleans during delivery prevent neonatal tetanus, ophthalmia neonatorum and puerperal sepsis thus reducing IMR and MMR.

Contents of DDK	Quantity
Gauze piece (7.5 cm × 1 m)	1
Packed new polythene cover	1
Ligature	2
Razor blade (ISI)	1
Soap (10 g)	1
Antiseptic lotion	10 mL
Cotton	10 g
Chloramphenicol aplicap	2

Baby is suffering from neonatal tetanus, because it matches with standard case definition of neonatal tetanus.

Standard case definition of neonatal tetanus:

Suspect: Newborn (neonate) with a history of normal suck and cry for the first 2 days of life and history of onset of illness between 3 and 28 days of age and history of inability to suck followed by stiffness and/or jerking of muscles.

Probable: Newborn (neonate) with a history of normal suck and cry for the first 2 days of life and history of onset of illness between 3 and 28 days of age and history of inability to suck followed by stiffness and/or "convulsion" and often death.

As the age of the baby is 7 days and he has excessive cry, refusal of food and convulsion, so he is suffering from neonatal tetanus.

Case management: Excellent 24 hours a day nursing care in a referral hospital, with careful use of drugs can reduce the case fatality rate from 80 to 50% or later. The following are the components of case management:

- Calm and quite atmosphere in an isolated word
- Human tetanus immunoglobulin (HTIG) is given to neutralize circulating antitoxin
- Antibiotics are given to destroy and control the vegetative forms. Penicillin is the drug of choice
- Anticonvulsants are provided to control the convulsion. Diazepam is the drug of choice
- Fluid and electrolyte balance should be maintained by IV fluid and tube feeding
- Expert nursing care for 24 hours
- Antipyretics are given for control of fever.

The following steps for prevention of neonatal tetanus by the respective health personnel:

A. **Situation analysis:**
   - *Measurement of the magnitude of the problem* by reviewing hospital reports and house to house visit
   - *Identification of predisposing factors:*
     - Lack of immunization with TT during pregnancy.
     - Lack of hygienic environment during delivery.
     - Lack of aseptic precautions (5Cs) while conducting delivery.
     - Brutal habits of cutting the umbilical cord with rusted blade or knife, followed by application of cow dung to the umbilical cord to control bleeding.
     - Use of dirty cloth to cover the umbilical cord.

B. **Setting objectives:** Important indicators are NNT mortality rate, TT_2 coverage and personnel attended deliveries.

C. **Assessment of resources:** Before implementation of several preventive strategies, BMOH should assess the following resources.

Manpower, material and money (Finance)

D. **Fixing priorities**

E. **Plan formulation**

F. **Implementation**

G. **Strategies adopted for prevention of neonatal tetanus:**
   - *Increase and sustain high coverage level with two doses or a booster dose of TT/Td:* In 1st pregnancy, two dosages of TT/Td are given. 1st dose should be given during registration (within 12 weeks) and 2nd dose should be given 4 weeks after 1st dosage. For effective protection against neonatal tetanus, 2nd dose must be given at least 3 weeks or more before childbirth, because after vaccination, antibody formation occurred after 3 weeks. **In the case of 2nd pregnancy**, if the time interval with the first pregnancy is within 3 years, only one booster dose is given, but if the interval is more than 3 years, two doses are given. Immunization coverage can be increased by health education and regular conduction of fixed and outreach sessions even at AWC through VHND.
   - *Increase proportion of deliveries by trained personnel:* For this purpose, promotion of institutional delivery is an effective approach. Strengthening of institutional delivery (24 × 7) all CHCs and 50% of PHC are made operational in phased manner.
   - *Training of dais:* For assisting pregnant mothers to hospital for institutional delivery.
   - **Supply disposable delivery kits** to ensure clean practices for domiciliary deliveries.
   - **Implement essential newborn care**, including cord care, to reduce the risks of neonatal tetanus.
   - **Continue IEC activities** in the community to promote clean deliveries with special focus in the areas from where cases have been reported and in areas where high proportion of deliveries were conducted by untrained personnel. IEC activity can be done through interpersonal communication, group approach (lecture, demonstration, role play, etc.).
   - **Strengthen surveillance system** and undertake follow up action in areas from where cases are reported.

Follow up action in areas where the case is reported:

- All neonatal deaths should be investigated through verbal autopsy to exclude neonatal tetanus. If there is a case of neonatal tetanus, status of immunization coverage and delivery practices should be assessed

with highest priority. All the components of the neonatal death investigation format should be reviewed thoroughly.

- Besides improving immunization coverage, training of dais should be taken up in the area.
- In areas, where proportion of deliveries by untrained personnel is still high, IEC activities on safe delivery practices should be stepped up and the DDK should be given to the pregnant women.

Q12. Nutritional requirements during pregnancy and lactation. *(ABKUB, 2018)*

Ans:

Nutrients	Pregnancy	Lactation
Protein	78 g/day	74 g/day
Visible fat	30 g/day	30 g/day
Calcium	1200 mg/day	1200 mg/day
Magnesium	310 mg/day	310 mg/day
Vit A (Retinol)	800 µg/day	950 µg/day
Vit C	60 mg/day	80 mg/day

Q13. A subcenter has a population of 5,500. How many pregnant women and infant will be there during a year? How will you organize an immunization session for infant and children and pregnant mothers? *(BNMUB, 2003)*

Ans: Antenatal care is the care of the women during pregnancy. The meaning of antenatal care is to achieve at the end of a pregnancy a healthy mother and healthy baby. The care starts soon after conception and continue throughout pregnancy.

Crude birth rate in India (2012) is 21.6/1,000 population (Census of India 2011). As some pregnancies may not result in a live birth, i.e., abortion and stillbirth may occur. The expected number of live birth would be an under estimation of the total number of pregnancies. So correction factor (pregnancy wastage) of 10% is added to the expected number of live birth.

Expected number of live birth/year in the subcenter in question = 21.6 × 5,500/1,000 = 118.8; Pregnancy wastage = 10% of 118.8 = 11.8; Expected total pregnant women in one year = 119 + 12 =131; Expected number of infants in the subcenter the number of live-births minus number of death of infant. Considering IMR 40 per 1,000, 5 infant will die from 119 infants. So the infants who will move for the second year of life will be 114 (119–5).

A subcenter is composed of 5–6 villages containing 5,000 population. Subcenter arranges immunization session on Wednesday at the office once in 1 month. Most of the children are taken by their mothers to the center for immunization. Remaining children are taken care of at their doorstep. Other Wednesdays of the month will be utilized for these infants and children. Outreach sessions are held in the village in ICDS center (AWC) or club house of the locality (community participation). These sessions are done every or alternate month depending upon the number of unvaccinated children, demand of the local people and leaders, participation of the voluntary workers (ASHAs, AWW, Link workers, etc).

A good planning with micro-plan for manpower, logistic support, vehicular support, vaccine transport, site selection, publicity in the area is essential.

Record keeping is mandatory to follow the next activity in the locality. Children number, vaccination date, advice to mothers, area covered, AEFI, etc., are recorded and utilized later on for future activity.

Q14. How will you plan antenatal services at primary health center (PHC) level with 30,000 population *(DU, 2016)*/**Describe how ANM, AWW and ASHA can co-ordinate each other for better MCH services.** *(SMU, 2012, 2014)*

Ans: Primary health center (PHC) is catering a population of 30,000. There are six subcenters in each PHC. If we collated the antenatal care services of all six subcenters it will reflected the services of PHC level.

A subcenter has been considered here having a population of 5,000. At first we have to find out approximate number of infants in the 5000 population.

Crude birth rate in India (2015) is 20.00/1000 population (Sample Registration System, Government of India, 2014). Some pregnancies do not result in a live birth, i.e., abortion and stillbirth may occur. The expected number of live birth would be an under estimation of the total number of pregnancies. So correction factor (pregnancy wastage) of 10% is added to the expected number of live birth.

Expected number of live birth/year in the subcenter = 20 × 5,000/1,000 = 100; Pregnancy wastage = 10% of 100 = 10; Expected total pregnant women in 1 year = 100 + 10 = 110; Expected number of infants in the subcenter the number of live-births minus number of death of infant. Considering IMR 40 per 1000, approximately 4 infants will die from 100 infants. So the infants who will move for the second year of life will be 96 (100 - 4).

A subcenter is composed of 5 villages containing 5000 population. Approximately each village having a infants and children 20. Subcenter arranges immunization session on Wednesday at the office once in a month. Most of the children are taken by their mothers to the center for immunization. Remaining children are taken care of at their doorstep. Other Wednesdays of the month will be utilized for these infants and children with help of 2nd ANM. Outreach sessions are held in the village in ICDS center (AWC) or club house of the locality (community participation). There are five ASHAs in five villages; they are maintaining their own register of child along with uncovered child. These sessions are done every or alternate month depending upon the number of unvaccinated children, demand of the local people and leaders, participation of the voluntary workers (AWW, Link workers, etc.).

A good planning with micro-plan for manpower, logistic support, vehicular support, vaccine transport, site selection, publicity in the area is essential.

Record keeping is mandatory to follow the next activity in the locality. Children number, vaccination date, advice to mothers, area covered, AEFI, etc., are recorded and utilized later on for future activity.

Again in **4th Saturday meeting**, convergence of activity regarding immunization of infants and pregnant mothers is held at panchayat level in the presence of Panchayat member, ANM, ASHA, AWW and trained TBA, etc., and subsequent upgradation of Eligible Couple and Child Register **(ECCR)** is discussed and done.

Q15. Lot of ladies died due to postpartum hemorrhage in your block. What steps will you take to reduce the condition in your block? *(WBUHS, 2008)*

Ans: A. **Situation analysis:**

- *Measuring the magnitude of the problem:* It can be measured by:
  - House to house survey: It will be time consuming and troublesome.
  - Records from registers of SC, PHC and BPHC: This method will be easier to collect data on infant death.
  - Hospital records: The record will not provide full information. The magnitude will help the administrator to allocate resources. Age, sex, caste, geography, health service situation, etc., will be noted to address the problem.
  - By community-based maternal death review.
- *Identification of causes:* PPH can be divided into primary PPH (occurs within 24 hours following delivery) and secondary PPH (occurs between 24 hours - 42 days after delivery).
  - Causes of primary PPH include: Grand multipara, over-distention of uterus, malnutrition, anemia, prolonged labor, uterine fibroid, mismanaged 3rd stage of labor, episiotomy wound or wound due to extension of episiotomy and abruptio placentae.
  - Causes of secondary PPH include: Retained placenta, inversion of uterus, placental polyp, infection.
- *Social causes of PPH:* Poor socioeconomic status, illiteracy, ignorance and prejudices, malnutrition, lack of access to skilled birth attendant (SBA) and emergency obstetric care and social delay (Type-1, 2, 3).

B. **Setting objectives:** To reduce the death due to PPH in significant proportion in his block within one year
C. **Identification of resources: Manpower, material and money (Finance)**
D. **Fixing priorities**
E. **Plan formulation**
F. **Implementation strategies:**

- *Management of existing cases of PPH*
  - Primary PPH: It can be managed by:
    - ◊ Injection ergometrine—0.25 mg/injection.
    - ◊ Start IV drip with ringer lactate and 20 unit of oxytocin is added to the drip.
    - ◊ Oxygen is given by the mask.
    - ◊ Blood transfusion, if blood storage unit is available.
    - ◊ Catheterize the bladder if it is full.
    - ◊ Bimanual uterine massage if the cause is atonic.
    - ◊ Explore genital tract for perineal, vaginal or cervical tear and repair it immediately.
  - Secondary PPH: It can be managed by:
    - ◊ Injection methyl ergometrine 0.2 mg IM 8 hourly for 24 hours followed by tablet Methyl Ergometrine BD for 3 days.
    - ◊ Bed rest, antibiotic, if blood loss is excessive and patient need exploration under anesthesia, patient should be immediately referred to FRU.
- *Preventive measures:*
  - **Early registration and at least 4 antenatal checkup.**
  - **Prevention and treatment of anemia during antenatal period**—for prophylaxis all pregnant women are supplemented with IFA tablets (containing 60 mg of elemental iron and 500 µg of folic acid) each tablet starting from fourth months of pregnancy for minimum of 180 days and continued for 180 days in postpartum period. Specific advices are given to all women to increase the compliance. Pregnant woman should be motivated for consumption of iron and folic acid rich diet. Anemia should be screened by clinically and by hemoglobin estimation during every checkup and if the patient is suffering from anemia, no. of IFA tablets should be double and severe anemia blood transfusion should be advocated.
  - **Prevention of malnutrition**—malnutrition is an important predisposing factor for PPH. It can be prevented by advice of consumption of one extra meal, regular consumption of supplementary nutrition provided by ICDS, adequate rest, avoidance of hard physical work, etc.
  - **Promotion of institutional delivery**—average time interval of death between onset of hemorrhage and death is 2 hours, which is too short to transport the woman to hospital in case of home delivery. During antenatal check up, all the pregnant woman should be clearly explained about the importance of home delivery. There should be 24 hours delivery facilities in CHCs and 50% of PHC. Proportion of institutional delivery can be increased by collaboration with private sector for provision of essential and emergency obstetric care facilities at designated private institutions according to Ayushmati Scheme.
  - **Provision of free transport facility** according to Matriyan scheme.
  - **IEC**—it can be provided through BMOH, MOs, BPHN, PHN, ANM, etc., through group approach or interpersonal communication. Hazards of PPH and preventive measures of PPH should be clearly explained to all pregnant women. BMOH should implement above mentioned strategies through following infrastructure and using different categories of manpower.

G. **Monitoring**
H. **Evaluation**
I. **Conclusion:** This last step will tell us whether the activities have achieved our objectives. If mortality of infant be reduced by these activities the program will be continued. If it did not work in the expected level, objectives will be reformulated and accordingly plan will be revisited and implemented. In this way, we will be able to take action to reduce the mortality of infants in that community.

Q16a. Proportion of institutional delivery is very low in your district. There is also poor utilization of the referral transport and Ayushmati scheme. What steps would you like to take as a CMOH to improve the situation? *(WBUHS, 20*

Q16b. In a Block of West Bengal, recent statistics showed lower rate of institutional delivery. As a health administrator of that block, what measures you like to adopt for improving institutional delivery in your block? *(WBUHS, 2017; AKUB, 20*

Ans: CMOH would investigate the situation in the following manner to assess overall status on the issue in question.

A. **Situation analysis**
- *Measurement of the magnitude of the problem:* Measured by house-to-house survey, records from Anganwadi Center, CHC, PHC, subcenter records and reports, etc.
- *Identification of the causes:*
  - Lack of availability of delivery facilities in CHC, PHC and subcenters
  - Lack of motivation and health awareness campaign by health workers, ASHA, AWW
  - Lack of transport facilities
  - Poor implementation of JSY
  - Poor implementation of Ayushmati scheme
  - Cultural inaccessibility
  - Illiteracy, ignorance
  - Poor quality of services and rude behavior of the healthcare providers

B. **Setting objectives:** To enhance the proportion of institutional delivery to 80% in his district within 1 year

C. **Assessment of resources: Manpower, material and money (fund)**

D. **Fixing priorities**

E. **Plan formulation**

F. **Implementation strategies:**
- Provision of 24 hours delivery facilities in all CHC and 50% of PHC
- *Provision of normal delivery facilities at subcenters:* Many people of the remote area cannot reach the PHC/CHC due to various reasons. A well-equipped subcenter is an option for normal delivery for the purpose of ensuring minimum facilities for conducting normal deliveries in subcenter, like proper facilities of light, electricity, water and other medical requirements for basic obstetric services including drugs, equipment and services of trained midwife
- Provision of free institutional delivery including emergency obstetric care at designated private hospitals
- Timely providing the benefits of JSY to eligible people (SC, ST, BPL woman, 19 years or above, up to two live births)
- Provision of free transport facility to the eligible women and the publicity to utilize this facility
- Training of different categories of staffs like doctors, nurses, ANM to improve the quality and coverage of services
- Improving behavior of healthcare providers to improve the acceptability of services
- Improving coverage and quality of antenatal care by targeting woman of SC, ST, BPL, and other marginalized group, etc., promotion of institutional delivery is an important component of antenatal check-up
- *IEC:* This can be given through mass media or group approach. Medical officer, BPHN/PHN, health supervisors, health workers, etc., can perform as health educator.

G. **Monitoring**

H. **Evaluation**

I. **Conclusion:** This last step will tell us whether the activities have achieved our objectives. If mortality of infant be reduced by these activities the program will be continued. If it did not work in the expected level, objectives will be reformulated and accordingly plan will be revisited and implemented. In this way we will be able to take action to reduce the mortality of infants in that community.

What is the importance of maternal death review? Maternal death review at community level. *(WBUHS, 2015, 2019; GNSUB, 2022)*

Ans: Maternal death review (MDR) process:

Five approaches are placed before us to understand why women die.

1. Maternal deaths in the community (CBMDR)
2. Maternal deaths in facilities (FBMDR)
3. Confidential enquiries into maternal deaths
4. Learning from women who survived: "near miss" cases
5. Evidence-based clinical audit

Maternal death surveillance cycle:

- Identify cases
- Collect information
- Analyze results
- Recommendations for action
- Implement, evaluate and refine

Policy on maternal death reviews is spelt out in implementation framework of RCH-II

- Strengthen monitoring/records/audit procedures
- Monitor state and regional level MMR
- Introduce mother-child linked card
- Conduct audit of maternal deaths at the hospital and community levels
- Develop tools for maternal death auditing and reporting

Maternal death review at community level: Most of the maternal death in our country can be prevented. If the cause of maternal death is reviewed and cause of death be identified, then future death can be prevented if it be preventable one with utmost maternal healthcare services.

Maternal death review (MDR), a strategy for monitoring maternal deaths, provides information on medical, social and health system factors that should be addressed to redress gaps in service provision or utilization.

The rights of pregnant women to receive respectful and skilled care from well-trained health professionals have become more prominent. The responsibility of maternity healthcare staff to continually evaluate and improve the care and services they provide is now widely accepted.

Every maternal death, avoidable or not, provides useful lessons to be learnt. In most resource limited countries, the reviews are mainly conducted at facility level, and, when possible, in the community, using verbal autopsy. They achieve improvements through implementation of recommendations arising from investigation and identification of the barriers women might have faced, the resources available, and the care received, where possible benchmarked against standards of best practice.

Define IMR. Discuss factors affecting IMR and suggest measures (various steps to be adopted urgently) for its prevention. *(WBUHS, 2010, 2012, 2014, 2018, 2021, 2022, 2023; MGUB, 2022, 2024; AKUB, 2021, 2022; BNMUB, 2016, 2017, 2018, 2019; VKSUAB, 2021; TRIU, 2016, 2020, 2023; SAMU, 2008, 2016; TDMGRMU, 2011, 2012, 2014; SSUHSA, 2009, 2013, 2016; SMU, 2010, 2012, 2015; BUMP, 2012; DU, 2013; YSRUHSAP, 2021; RGUHS, 2012, 2013; RUJH, 2014; NU, 2014, 2015; KIMS, 2019; VNSGUS, 2023)*

IMR-current scenario in India. *(WBUHS, 2019)*

Year-wise infant mortality rate in India

2014	2015	2016	2017	2018	2019	2020
39	37	34	33	32	30	28

(Source: SRS data 2020)

Q18c. Prepare an action plan for reducing the infant mortality and morbidity in a PHC of your district. *(BNMUB, 2008)*

Ans: Definition of infant mortality rate (IMR): It is defined as 'the ratio of infant deaths registered in a given year to the total number of live births registered in the same year, usually expressed as a rate per 1000 live births. It is given by the following formula:

$$\text{IMR} = \frac{\text{Number of death of children less than 1 year of age in a year}}{\text{Number of live birth in the same year}} \times 1000$$

Common causes of infant mortality *(ABKUB, 2019)*

Neonatal mortality: Death among neonates is not very less. So the causes of death in neonatal period can be ascertained from the data. The causes may be low birth weight, birth injury, sepsis, birth asphyxia, hemolytic disease of the newborn, neonatal tetanus, ARI, diarrhea singly or in combination.

Postneonatal mortality: The causes of death during postneonatal period of infancy may be singly or in combination of any of the following conditions. They are ARI, diarrhea, other communicable diseases, malnutrition, accidents, malignancy, etc.

The important cultural and social factors affecting infant mortality are discussed below:

Factors affecting IMR:

A. **Biological factors:**
- *Birth weight:* It is a major determinant of infant and perinatal mortality and morbidity. Babies of low birth weight (under 2.5 kg) and high birth weight (over 4 kg) are at special risk. Major causes of the death of the low-birth weight babies are infection and hypothermia.
- *Age of the mother:* There is a definite relationship between age of the mother and fate of the child. Infant mortality rate is greater, when the mother is very young or relatively older.
- *Birth order:* Highest mortality is found among and the lowest among those born second. The risk of infant mortality escalates after third birth. The fate of the 5th and later children is always worse than fate of the 3rd child.
- *Birth spacing:* Repeated pregnancies exert a great influence on infant mortality. They cause malnutrition and anemia of the mother, again predisposes to low birth weight, which result in higher infant death.
- *Multiple births:* Infants born in multiple birth number face a greater risk of death than do these in single births due to large part to the greater frequency of low birth weight among the mother.
- *Family size:* The number of episodes of diarrhea, prevalence of malnutrition and severe respiratory infections has been found to be increase with family size. Besides the frequency of disease, the duration of illness is also affected by the family size. It was found that duration of illness is much longer in three or more children.
- *High fertility:* It is one of the factors which influence infant mortality.

B. **Economic factors:** The availability and quality of healthcare and the nature of child's environment are closely related to socioeconomic status. Infant mortality rate is highest in the slums and lowest in the richer residential localities.

C. **Cultural factors:**
- *Feeding practice of pregnant mother:* During antenatal period, less amount of foods are being given to mother as a result the child becomes small (weight) and belief is evident in the community that less difficulty will be experienced by mothers during delivery of child. Less/hard food substances are given to mothers.
- *Feeding practices:* Following faulty feeding practices are risk factors for high infant mortality—prelacteal feeding, no colostrum feeding practices, exclusive breastfeeding is not practiced, delayed initiation of breastfeeding and early introduction of complementary feeding.
- *Religion and caste:* The differences are attributed to socio-cultural patterns of living, customs, traditions affecting cleanliness, eating, clothing, childcare, etc.

- *Sex of the child:* Female infants receive far less attention than male.
- *Quality of mothering:* Even in the condition of the extreme poverty, child could reasonably survive if they had an efficient mother, bath with soap after birth is observed in different community, putting the child in normal (ambient) temperature provides risk of hypothermia. Kajol in eyes is used. Putting the child in Sunlight with mustard oil and eyes open causes skin burn.
- *Maternal education:* Illiteracy is the greatest barrier to any improvement of the health condition. Mother's education level, even in the same socioeconomic status is a key determinant of their children's health.
- *Quality of healthcare:* The percentage of deliveries attended by untrained persons are relatively high in rural India. Shortage of manpower like doctors, nurses, paramedical workers, lack of training facility can lead to poor quality of healthcare delivery, which is an important cause of high infant mortality.
- *Lack of transport facility and poor transport condition:* Many of the severely ill cannot reach to the appropriate healthcare facility for this reason, which leads to infant mortality.
- *Broken family:* Infant mortality tends to high, where the mother or father died or separated.
- *Illegitimacy:* It is an important contributory factor.
- *Brutal habits and customs:* Certain age-old customs and beliefs greatly influence infant mortality rate. This include frequent purgation, branding of the skin and application of cow dung to the cut end of umbilical cord, after delivery cord are being separated by old razor or knife or bamboo skin slice, etc.
- *Bad environmental sanitation:* Infants are highly susceptible to bad environmental sanitation like lack of safe water supply, poor housing condition, bad drainage and overcrowding.

D. **Social factors:**
- Birth preparedness is not done before-hand
- Home delivery is often seen
- Money is scarcity to the mothers and not arranged by parents
- Transport to hospital is not arranged beforehand
- Blood group of mother is not known

Action plan for reducing the infant mortality and morbidity; Please referred to Q.5

Q19. What do you mean by neonatal mortality? Why it is so important? Write in brief components of essential newborn care with special reference to breastfeeding. *(WBUHS, 2016, 2018; AKUB, 2022; BNMUB, 2002; SAMU, 2015)*

Ans: Neonatal mortality rate $= \frac{\text{Number of death of children under 28 days of age in a year}}{\text{Total live birth in the same year}} \times 1000$

Neonatal mortality is an important for the following reasons:
- It is expected that 40% of all stillbirths and neonatal deaths take place during labor and the day of birth
- 75% of total neonatal deaths occur within 1st week of life
- Half of all maternal deaths occur in 1st week of delivery **(Fig. 10.2)**

The different components of essential newborn care are given below:

Resuscitation of newborn:
- Make a quick assessment to see if the baby is breathing and respiration is established
- If the baby does not cry spontaneously clear the airways using a soft, clean cloth/gauze wrapped around index finger
- Do not slap the buttocks or hold baby upside down
- Give only gentle flicks to the soles of the baby's feet, if at all required

Prevention of hypothermia:

Immediately after the baby is born:
- Dry the baby quickly with a warm, clean and soft and sun-dried cotton cloth
- Keeping the baby warm by placing the baby in directs skin-to-skin contact with mother

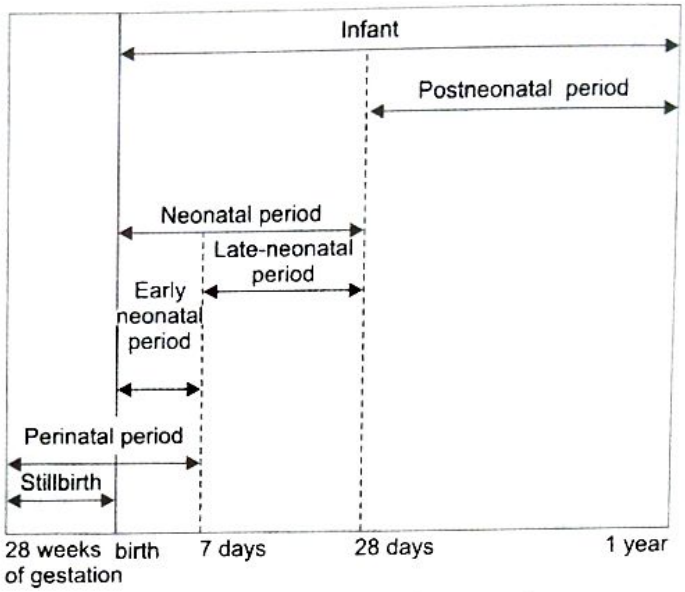


Fig. 10.2: Perinatal and infant period.

- Wrap the newborn in several layers of cotton/woolen clothing depending on the environmental temperature
- The room where newborn is kept must be warm enough for an adult to feel just uncomfortable and should be free from draughts

Immediate bath can lead to hypothermia: No bath should be given to the baby until 7 days after delivery. If baby is low birth weight (<2.5 kg) postpone the birth after 1 week.

Prevention of infection of the newborn by appropriate cord, eye and skin care.

- **Care of the cord:**
  - The cord must be left clean and dry.
  - Do not apply any medication or dressing over the cord stump. Check to ensure that cord stump is not bleeding.
- **Care of the eyes:** Before the eyes are open, the lid margin of the newborn should be cleaned with sterile wet swabs, one for each eye, from inner to the outer side.
- **Immunization of the newborn with BCG, OPV-0 and Hep-B vaccine at birth is important.**
- **Handling the newborn with minimum number of care givers is advocated.**
- **Keep the room clean, warm and dust free.**

Appropriate feeding practices according to the guideline of infant and young child feeding (IYCF) guideline—no prelacteal feeding, early initiation of breastfeeding (in normal delivery-within 1 hour and in cesarean section—within 4 hours), advice demand feeding and night feeding but no bottle feeding.

Q20a. What is perinatal mortality? Outline the causes, methods of prevention and control of perinatal mortality? *(WBUHS, 2022; ABKUB, 2019; BNMUB, 2006; YSRUHSAP, 2014, 2023; RGUHS, 2012, 2013; NU, 2016; KIMS, 2019; AKUB, 2023; MU, 2023; RUJH, 2024)*

Ans: Perinatal mortality rate (PMR): The term 'perinatal' includes late fetal death (stillbirths) and early neonatal death. It lasts from 28th week of gestation to the 7th day after birth.

Definitions: The WHO's definition, more appropriate in nations with well-established vital records of stillbirth is as follows:

$$\textbf{PMR} = \frac{\text{Late fetal death + Early neonatal death in 1 year}}{\text{Live birth + Late fetal deaths in the same year}} \times 1000$$

The WHO definition, more appropriate in nations with **less well-established vital records** of stillbirth is as follows:

$$\text{PMR} = \frac{\text{Late fetal death + Early neonatal death in 1 year}}{\text{Live birth in the same year}} \times 1000$$

International comparisons: In 1970, WHO expert committee on the prevention of perinatal mortality/ morbidity recommended a more precise formulation.

$$\text{PMR} = \frac{\text{Late fetal and early neonatal deaths weighing over 1000 gram at birth}}{\text{Total live birth weighing over 1000 gram at birth}} \times 1000$$

Current status of perinatal mortality rate is 22/1000 live birth. (As per SRS data 2018)

Perinatal mortality is an important indicator of MCH care. *(WBUHS, 2019)*

Ans: Perinatal mortality rate has assumed greater significance as a yardstick of obstetric and pediatric care before and around the time of birth.

Reasons are:

1. Stillbirths and deaths within 1st week of life are included in perinatal mortality rate because the factors responsible for these two types of deaths are often similar.
2. A proportion of deaths which occur after birth are incorrectly registered as stillbirths, thereby inflating the stillbirth rate and lowering neonatal death rate.

Considering the above reasons the perinatal mortality rate is an important indicator.

The various causes of perinatal mortality are outlined below:

- **Antenatal causes:**
  - *Maternal disease:* Hypertension, cardiovascular disease, diabetes, tuberculosis and anemia
  - *Pelvic disease:* Uterine myomas, endometriosis, ovarian tumors
  - *Anatomical defect:* Uterine anomalies, incompetent cervix
  - Blood incompatibilities
  - Malnutrition
  - Toxemia of pregnancy
  - Antepartum hemorrhage
  - Congenital defects
  - Advance maternal age
- **Intranatal causes:**
  - Birth injuries
  - Birth asphyxia
  - Prolong labor
  - Obstetric complications
- **Postnatal causes:**
  - Prematurity
  - Respiratory distress syndrome
  - Respiratory and alimentary infections
  - Congenital anomalies

Prevention and control of perinatal mortality: Answer from Q.5

Enumerate the different categories of manpower available at Block level for delivering the primary healthcare. Outline the services a newborn is expected to receive from the subcenter and ASHA from birth up to 5 years of age. *(WBUHS, 2017)*

Ans: Block/Community health center catering population of (80,000–1,20,000)

Doctors	*Existing*	*Recommended*
Block health officer/Medical Superintendent	1	
General Surgeon	1	
Physician	1	1
Obstetrician and Gynecologist	1	
Pediatrician	1	1
Anesthetist	–	–
Eye Surgeon	–	1 for every 5 CHCs
Dental Surgeon	–	
General Duty Medical Officer	1	2
General Duty Medical Officer of AYUSH	–	1

Support Manpower	*Existing*	*Recommended*
Staff Nurse	7	10
Public Health Nurse	–	1–2
Pharmacist/Compounder	1	2
Lab Technician	1	2
Radiographer	1	1
Ophthalmic Assistant	1	1
Dental Assistant	-	1
Cold chain and vaccine logistic assistant	-	1
Dresser	1	
Ward Boys	2	5
Registration Clerk	-	2
Account Assistant	-	1
Admin Assistant	1	
Data Entry Operator	1	2
OT Technician	1	
Counselor	-	-
Driver	-	1
Dietician	-	-

As majority of subcenter, deliveries are not been conducted, so the ANM, AWW, ASHA are engaged in home-based management.

Q21a. Home-based newborn care (HBNC). *(WBUHS, 2023; SAMU, 2022; AKUB, 2024; ABKUB, 2021)*

Ans: The aim is to improve newborn survival. The strategy of universal access to home-based newborn care must complement the strategy of institutional delivery to achieve significant reduction in postpartum and neonatal mortality and morbidity. The providers of service include AWW, ANM, ASHA and medical officer. However, ASHA is the main person involved in home-based newborn care.

The major objective of HBNC is to decrease neonatal mortality and morbidity through:

1. The provision of essential newborn care to all newborns and the prevention of complications.
2. Early detection and special care of preterm and low birth weight newborns.

3. Early identification of illness in the newborn and provision of appropriate care and referral.
4. Support the family for adoption of healthy practices and build confidence and skills of the mother to safeguard her health and that of the newborn.

ASHA will make visits to all newborns according to specified schedule up to 42 days of life. **The visits schedule are as follows:**

- Six visits in the case of institutional delivery (Day 3, 7, 14, 21, 28 and 42).
- Seven visits in the case of home delivery (Day 1, 3, 7, 14, 21, 28 and 42).
- In cases of cesarean section delivery, where the mother returns home after 5–6 days, ASHAs are entitled to full incentive of ₹ 250/- if she completes all five visits starting from Day 7 to Day 42.
- In cases when a newborn is discharged from SNCU, ASHAs are eligible to full incentive amount of ₹ 250/- for completing the remaining visits. In addition, ASHAs are also eligible to full incentive amount of ₹ 50/- for monthly follow up of low-birth-weight babies and newborns discharged from SNCU. The low birth weight are followed up for 2 years and SNCU discharged babies for 1 year.
- In cases where the woman delivers at her maternal house and returns to her husband's house, two ASHAs undertake the HBNC visits, i.e., one at maternal house immediately after delivery, and another one at husband's house when the newborn returns home or vice versa. In such cases, the HBNC incentive of ₹ 250/- can be divided into two parts in such a way that each ASHA who completes three visits or more is entitled to ₹ 125. In these instances, if an ASHA undertakes less than three visits she would not be entitled to HBNC incentive.
- In cases of twin or triples the incentive amount for ASHA would be two time of the regular HBNC incentive of ₹ 250—(i.e., ₹ 500) or three times of ₹ 250—(i.e., ₹ 750) respectively.

The incentive money is paid to ASHA on 45th day subject to the following:

- Record of birth weight in the mother and child protection card
- Immunization of newborn with BCG, first dose of OPV, hep B and DPT/Pentavalent vaccine and entry into the mother and child protection card
- Registration of birth
- Both mother and newborn are safe until 42nd day of delivery.
- The ASHA workers also engaged in immunization of children up to 5 years of age in the subcenter and VHNDs and vitamin A supplementation up to 5 years. Also find out drop out children if any in her working area.

Q22. What are the different newborn care facilities available at different levels of health facility? *(WBUHS, 2018)*/ **Facility-based newborn care.** *(WBUHS, 2016; BNMUB, 2021)*

Ans: As more sick children are screened at the peripheries through IMNCI and referred to health facilities, care of sick newborn and child at CHCs, FRUs, District hospitals and Medical college hospitals assumes priority. Equipping the facilities to provide the requisite level of care and simultaneously enhancing the capacity of medical officers at these facility to handle such cases is an important issue. The setting up SNCUs at district hospitals, newborn stabilization unit (NBSU) at CHCs and newborn care corners in all facilities where deliveries are conducted is the key issue.

The newborn care facilities at different levels are as follows:

Health facility	*All newborn at birth*	*Sick newborns*
Primary health center (PHC)/Subcenter identified as MCH level 1	Newborn care corner in labor rooms	Prompt referral
Community health center (CHC)/First referral unit (FRU) identified as MCH level II	Newborn care corner in labor rooms and operation theatre	Newborn stabilization unit (NBSU)
District hospital identified as MCH level III	Newborn care corner in labor rooms and operation theatre	Special newborn care unit (SNCU)

Newborn care corner (NBCC): It is a place within the delivery room in any health facility where immediate care is provided to all newborns at the time of birth. This area is **MANDATORY** for all health facilities where deliveries are conducted.

Newborn stabilization unit (NBSU): It is a facility within or in close proximity of the maternity ward where sick and low birth weight newborns can be cared during short periods All FRUs/CHCs need to have a neonatal stabilization unit along with the newborn care corner. It requires space for four bedded unit and two beds for postnatal ward for rooming-in.

Special newborn care unit (SNCU): It is a neonatal unit in the vicinity of the labor room which is to provide special care for sick newborns. Any facility with more than 3,000 deliveries per year should have an SNCU (Most district hospitals and some sub-district hospitals would fulfill this criteria). The minimum required number of beds for an SNCU at a district hospital is 12. If a district hospital conducts more than 3,000 deliveries per year, four beds should be added for each 1,000 additional deliveries.

Q23. What are the functions of an under-five clinic? How will you organize an under five clinic in a subcenter? *(BNMUB, 2003; RGUHS, 2002, 2008)*

Ans: Under five clinic is a center where preventive, promotive, curative care, referral and educational services are provided in a package manner for the under five children under one roof. The services are provided by trained nurse. That is why, it is economical. It can cover large proportion of under-fives, also considered as primary healthcare among small children.

The subcenter and primary health center function as under-five clinic in one afternoon every week and OPD of Pediatrics department in hospitals function as under-five clinic every day. The functions of under-five clinic are shown **Figure 10.3** diagrammatically as an **'Emblem' (Fig. 10.3)**. The emblem consists of six triangles two large and four small ones.

The apical small triangle represents 'curative services', i.e., care in illness. Common problems are diarrhea, respiratory symptoms. In early stage, distribution of ORS and Cotrimoxazole tab is needed and sometimes the patient is referred to medical officer. Thus, mother's felt need of treating the children is fulfilled.

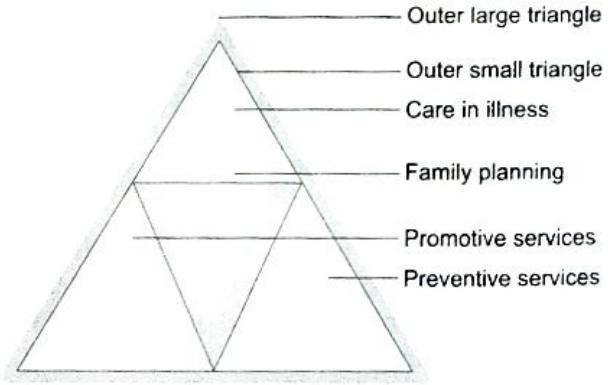


Fig. 10.3: Emblem of under-fives clinics.

The early diagnosis of malnutrition is detected through weighing of child periodically. The causes of growth failure like defect in feeding practices, infections and infestation are detected. The general health checkup is done periodically.

The left small triangle represents promotive services such as growth monitoring and health check-up.

The right small triangle represents 'preventive services' such as routine immunization, vitamin A prophylaxis for 5 years with a total of nine doses and distribution of IFA (pediatric) tab.

The central inverted triangle represents the symbol of 'family planning' of India and it touches the three triangles. It is the 'center of concern' for the health and well-being not only for child but also for entire family. As the mother accompanies the child, the family planning services can be implemented through cafeteria choice.

The small outer triangle constitutes the margin of small four triangles. The outer large triangle constitutes 'health education' which mother automatically received for care of her child like growth monitoring, oral

supplementation therapy, breastfeeding, immunization, family planning, personal hygiene as well as importance of female literacy.

What do you understand by Low-birth-weight babies? How such babies are classified? What is the prevalence of LBW babies in India and target to achieve? *(WBUHS, 2008, 2015, 2019; AKUB, 2022; DSUB, 2022, 2023; MGUB, 202, 2023, 2024; BNMUB, 2015; GITAMAP, 2023; RGUHS, 2014; SSUHSA, 2015; UMGRMU, 2012; SAMU, 2015; MU, 2019)* **Proportion of low-birth-weight babies in your block is very high. As a BMOH what action will you take to tackle the situation?** *(WBUHS, 2009; VNSGUS, 2023)*

Low birth weight babies: According to WHO, a newborn is said to have low birth weight if it weighs less than 2500 gram and weight will be taken within 1 hour of birth, irrespective of the gestational age. According to Indian scientists, birth weight of 2 kg or less is considered as the criteria to call low birth weight because of the widespread prevalence of maternal malnutrition. Low birth weight is the single most determinant for the survival, growth and development of the infant. The survival chances of a newborn are directly proportional to the birth weight. Since LBW newborn is highly susceptible for complications like infection and hypothermia, the incidence of LBW contributes significantly for increased morbidity and neonatal mortality.

Classifications:

- **Preterm baby:** Preterm baby is a baby, who was born after 28 complicated weeks and before 37 complicated weeks of gestation (between 196 to 259 days). The intrauterine growth for the pregnancy period is normal but since it is born before 37 weeks, it is also called premature baby.
- **Small for date baby:** Small for date baby is a newborn, which is smaller and lighter than what it should have been for that pregnancy period due to failure in the intrauterine growth.
- **Prevalence of low-birth-weight babies in India:** About 28% of babies born in India are low birth weight as compared to 4% in some developed countries.
- **Target to achieve:** Reduction in incidence of low birth weight to less than 10% by 2010 AD; to reduce the low-birth-weight babies up to 10% in the block within 2 years. This amount of time should be given to implement the program and to assess the improvement if any.

BMOH is Block Medical Officer of Health in one administrative community development block. He leads the band of healthcare providers in his area of operation. He will take the steps in the following manner:

1. **Situation analysis:**
   - *Measuring the magnitude of the problem*—it will be measured by house-to-house survey, review of records from Anganwadi Center, review of records from hospital.
   - *Measuring the distribution of problem*—BMOH will find out whether male/female babies are more affected. Which socioeconomic groups are more affected, whether preterm/small for date babies are more.
   - *Identification of the causes:*
     - Causes of preterm babies are acute infection, multiple birth, hard physical work, hypertensive disorders of pregnancy, etc.
     - Causes of small for date babies are malnutrition, severe anemia, hard physical work during pregnancy, hypertension, malaria.
     - Social causes are smoking, poor socioeconomic status, teenage pregnancy, repeated pregnancies at quicker interval, low education status.
2. **Setting of objectives**
3. **Identification of resources: Manpower, material and money (finance)**
4. **Fixing priorities**
5. **Plan formulation:** Preparation of detailed plan(s) in all respects for the execution of a project for all kinds of activities to reduce mortality of infants will be made. Expected outcome objectives should be considered during planning. It might include maternal care, newborn care, childcare in respect of feeding, weaning, vaccination, etc. Each activity will be monitored and ultimately evaluation should be a part of this plan.
6. **Implementation of strategies:** Activities should be started according to plan.

rehydration therapy, breastfeeding, immunization, family planning, personal hygiene as well as importance of female literacy.

Q24. What do you understand by Low-birth-weight babies? How such babies are classified? What is the prevalence of LBW babies in India and target to achieve? *(WBUHS, 2008, 2015, 2019; AKUB, 2022; GNSUB, 2022, 2023; MGUB, 202, 2023, 2024; BNMUB, 2015; GITAMAP, 2023; RGUHS, 2014; SSUHSA, 2015; TDMGRMU, 2012; SAMU, 2015; MU, 2019)***/Proportion of low-birth-weight babies in your block is very high. As a BMOH what action will you take to tackle the situation?** *(WBUHS, 2009; VNSGUS, 2023)*

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A. **Situation analysis:**
   - *Measuring the magnitude of the problem*—it will be measured by house-to-house survey, review of records from Anganwadi Center, review of records from hospital.
   - *Measuring the distribution of problem*—BMOH will find out whether male/female babies are more affected. Which socioeconomic groups are more affected, whether preterm/small for date babies are more.
   - *Identification of the causes:*
     - Causes of preterm babies are acute infection, multiple birth, hard physical work, hypertensive disorders of pregnancy, etc.
     - Causes of small for date babies are malnutrition, severe anemia, hard physical work during pregnancy, hypertension, malaria.
     - Social causes are smoking, poor socioeconomic status, teenage pregnancy, repeated pregnancies at quicker interval, low education status.

B. **Setting of objectives**

C. **Identification of resources: Manpower, material and money (finance)**

D. **Fixing priorities**

E. **Plan formulation:** Preparation of detailed plan(s) in all respects for the execution of a project for all kinds of activities to reduce mortality of infants will be made. Expected outcome objectives should be considered during planning. It might include maternal care, newborn care, childcare in respect of feeding, weaning, vaccination, etc. Each activity will be monitored and ultimately evaluation should be a part of this plan.

F. **Implementation of strategies:** Activities should be started according to plan.

Management of low-birth weight babies: If weight is below 2 kg, patient is referred to higher center after initial stabilization. If the weight is between 2–2.5 kg, the following steps of essential newborn care should be done with special precautions.

Resuscitation of newborn

- **Prevention of hypothermia** by keeping the room worm, cleaning the baby with towel and wrap the baby with 2–3 layers of cloth, covering the head of the baby, no bathing in first 7 days and provision of hypothermia kit to the mother and the baby at free of cost.
- **Prevention of infection of the newborn** by keeping the room clean, appropriate cord, eye and skin care, immunization of the newborn with BCG, OPV-0 and Hep-B vaccine at birth, handling the newborn with minimum number of care givers.
- **Appropriate feeding practices** according to the guideline of infant and young child feeding (IYCF) guideline-no prelacteal feeding, early initiation of breastfeeding (in normal delivery—within 1 hour and in cesarian section—within 4 hours), advice demand feeding and night feeding but no bottle feeding.

  Home-based care of the newborn at 3, 7, 14, 21, 28, 42 by ASHA and ANM for identification and appropriate management/referral of low-birth-weight baby.

  Kangaroo mother cares: Babies will be kept in-between breasts. Mothers will provide warmth.

  Prevention of future recurrence of low-birth-weight baby:

  Motivation of the mother by ASHA, ANM, AWW about importance of antenatal check up is essential.

  Provision of four minimum antenatal checkup in all pregnant women and during this check up following parameters should be assessed comprehensively.

  Weight of the mother, BP, edema, fundal height, blood for hemoglobin, glucose, urine for sugar, albumin, etc., are essential laboratory tests to assess the status of mothers.
- **Advice on diet and rest to the all pregnant women:** Diet should contain all necessary macro and micronutrients, consumption of one extra meal, regular consumption of supplementary nutrition provided by Anganwadi Center, reduction of smoking and alcohol to a minimum level, avoidance of hard physical labor during pregnancy.
- **Advice on family planning** for prevention of repeated pregnancies at quicker interval and family planning services should be strengthened by provision of at least one surgical method of family planning in each CHC, provision of OCP, condom and facilities of IUD insertion at subcenter level.
- **Training of different categories of staffs** like doctor, nurse, ANM in prevention and management of low birth weight babies.
- **Regular meeting with staffs** about implementation of several strategies and identification of the needs and problems during implementations
- **Intersectoral coordination** with Panchayat, women and child development, NGOs, self-help group BMOH should implement the above mentioned strategies through following level of healthcare delivery system and using different categories of manpower.

G. **Monitoring**

H. **Evaluation**

I. **Conclusion**

Q25a. What is baby friendly hospital initiative (BFHI)? Enumerate the 10 steps of successful breastfeeding, outline the advantages of exclusive breastfeeding. How long will you recommend exclusive breastfeeding and breastfeeding? *(WBUHS, 2008; BNMUB, 2012, 2013; ABKUB, 2022; RGUHS, 2009; GUAMAH, 2023)*

Q25b. What do you mean by "continue feeding during illness"? *(BNMUB, 2008)*

Q25c. Breast milk is the ideal and only food for the infant till 6 months of age—justify. *(WBUHS, 2008, 2021; BNMUB, 2023; ABKUB, 2023)*

Ans: The global baby friendly hospital initiative (BFHI) has listed 10 steps, which the hospital must fulfill for successful breastfeeding (revised in 2018)

Critical management procedure:

1a. Comply fully with the International Code of Marketing of Breast-milk Substitutes and relevant World Health Assembly resolutions.

1b. Have a written infant feeding policy that is routinely communicated to staff and parents. 1c. Establish ongoing monitoring and data management systems.

2. Ensure that staff have sufficient knowledge, competence and skills to support breastfeeding.

Key Clinical Practices:

3. Discuss the importance and management of breastfeeding with pregnant women and their families.
4. Facilitate immediate and uninterrupted skin-to-skin contact and support mothers to initiate breastfeeding as soon as possible after birth.
5. Support mothers to initiate and maintain breastfeeding and manage common difficulties.
6. Do not provide breastfed newborns any food or fluids other than breast milk, unless medically indicated.
7. Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day.
8. Support mothers to recognize and respond to their infants' cues for feeding.
9. Counsel mothers on the use and risks of feeding bottles, teats and pacifiers.
10. Coordinate discharge so that parents and their infants have timely access to ongoing support and care.

There is substantial evidence that implementing the Ten Steps significantly improves breastfeeding rates. A systematic review of 58 studies on maternity and newborn care published in 2016 demonstrated clearly that adherence to the Ten Steps impacts early initiation of breastfeeding immediately after birth, exclusive breastfeeding and total duration of breastfeeding. From: http://www.who.int/nutrition/bfhi/ten-steps/en/

Exclusive breastfeeding means only breast-milk is given. No other food or drink even water is given. Vitamin, minerals, drops, ORS can be given, when medically indicated.

Breastfeeding: According to the guidelines of IYCF, breastfeeding is the only ideal food for first 6 months and it should be continued up to 2 years with nutritionally adequate, age appropriate, safe complementary feeding at first 6 months.

Q25d. Advantages (benefits) of exclusive breastfeeding (EBF) *(WBUHS, 2020, 2022, 2023; MGUB, 2022; BNMUB, 2022; ABKUB, 2003; RGUHS, 2012, 2013; TRIU, 2014, 2016; SAMU, 2015; TDMGRMU, 2010; SSUHSA, 2010, 2018; KIMS, 2016; SMU, 2009, 2012; NU, 2010; MU, 2022; AFUB, 2023)*

Ans: Advantages of breastfeeding are discussed below:

- It is safe, clean, hygienic, cheap and available to the infant at correct temperature.
- It fully meats the nutritional requirements of infant in first few months of life.
- It contains antimicrobial factors such as macrophages, lymphocytes, anti-streptococcal factor, lysozyme and lactoferrin which provide considerable protection not only against diarrheal diseases and necrotizing enterocolitis.
- It promotes bonding between the mother and infants.
- Sucking is good for the baby—it helps in development of jaw and tooth.
- It protects the babies from tendency to obesity.
- It prevents malnutrition and reduces the infant mortality.
- It provides biochemical advantages such as prevention of neonatal hypocalcemia and hypomagnesemia.
- It helps parents to space their children by prolonging the period of infertility.

So, breast milk is the ideal and only food for the infant till 6 months.

There should be demand feeding and night feeding. Appropriate positioning and attachment are necessary for successful breastfeeding. Whether breastfeeding can satisfy the baby in first 6 months can be assessed by following indicators.

The baby is passing urine eight times or more in 24 hours gaining of weight 500 g/month or more is optimum.

Recommendation of exclusive breastfeeding: It will be recommended for 6 months, because it is the only and ideal food for first 6 months for advantages like protection against infection, meeting nutritional requirement, etc.

Continuation of breastfeeding: Breastfeeding should be continued up to 2 years of age according to IMCI guideline. According to this guideline, breastfeeding should be continued up to 2 years with nutritionally adequate, age appropriate, safe complementary feeding. After 6 months of age, breastfeeding alone cannot meet the nutritional requirement.

Continued feeding during illness: During illness of under-five children like ARI, measles, diarrhea, there is a common tendency among mothers is to reduce the amount of feeding of their children, which is very harmful practice. This can precipitate undernutrition. To combat this problem, normal amount of food should be given during illness and soon after the recovery, extra amount of food should be given for catch up growth. Feeding should be continued as usual during any kind of illness of the child and it may require extra amount during recovery period.

Q8. What is congenital rubella syndrome? How do you assess the probability of its occurrence? Is it possible to prevent it by immunization? How? *(ABKUB, 2016; RGUHS, 2011, 2013, 2015)*

Ans: Congenital rubella syndrome refers to infants born with defects secondary to intrauterine infection or who manifest signs and symptoms of intrauterine infection sometime after birth. Classical triad consists of deafness, cardiac malformation and cataract. If associated with glaucoma, retinopathy, microcephalus, cerebral palsy, intrauterine growth retardation, hepatosplenomegaly, mental and motor retardation termed as expanded rubella syndrome. Congenital rubella syndrome occurred when infant has IgM rubella antibodies shortly after birth IgG antibodies persists for more than 6 months.

Etiopathogenesis: Congenital rubella syndrome occurs due to maternal infection with rubella in 1st trimester of pregnant (most dangerous time). The virus inhibits cell division resulting multiple structural defects.

Once infected the fetus remains infected throughout the period of gestation and many months or years after birth.

Probability of occurrence: Probability of occurrence is dependent upon gestational age at which maternal infection occurs which is a major determinant of extent of fetal damage. Infection early in pregnancy result in extensive damage to fetus.

Stage of gestation	Probability of occurrence	Manifestation
4–8 weeks	80%	Abortion, stillbirths, skin lesions (blueberry muffin lesions)
8–12 weeks	25%	Classical triad
12–16 weeks	10%	Deafness only
>17 weeks	00%	No major abnormalities

Prevention: It is possible to prevent congenital rubella by preventing maternal infection by active and passive immunization.

A. **Active immunization**

- *Monovalent rubella vaccine*

  Type: Live attenuated, freeze-dried vaccines, supplied with diluents
  - Examples: Wister RA/3 vaccine
  - Efficacy: 95%
  - Immunity: 15 years
  - Dose: 0.5 mL
  - Route of administration: Subcutaneously at left upper arm
  - Indications: 9–12 months of age and women aged 15–49 years

- Adverse effects: Malaise, fever, mild rash and transient arthralgia
- Contraindications: Pregnancy
- Remarks: If female vaccinated for rubella, advice against pregnancy for next 3 months

• *Combined vaccine:*
- Type: Live attenuated, freeze-dried vaccines, supplied with diluents, Example, MMR
- Indication: 12–15 months of life

B. **Passive immunization: Done using human normal immunoglobulins**
- *Indications:* Infected mothers, at risk individuals, i.e., close contacts
- *Timing:* Within 2–3 days of exposure
- *Dose:* 20 mL
- *Route of administration:* Intramuscularly

SHORT NOTES AND RELEVANT QUESTIONS

"Mother and child are one unit"—justify. *(SMU, 2010)*

Ans: **Mother and child must be considered as one unit because:**
- During the antenatal period, the fetus is part of the mother. The period of development of fetus in mother is about 280 days. During this period, the fetus obtains all the building materials and oxygen from the mother's blood.
- Child health is closely related to maternal health. A healthy mother brings forth a healthy baby; there are less chances for a premature birth, stillbirth or abortion.
- Certain diseases and conditions of the mother during pregnancy (e.g., syphilis, German measles, drug intake) are likely to have their effects upon the fetus.
- After birth, the child is dependent upon the mother. At least up to the age of 6 to 9 months, the child is completely dependent on the mother for feeding. The mental and social development of the child is also dependent upon the mother. If the mother dies, the child's growth and development are affected (maternal deprivation syndrome).
- The mother is also the first teacher of the child.

Considering the above said reasons, the mother and the child are treated as one unit.

Crèches. *(SSUHSA, 2006)*

Ans: In exercise of the power conferred by clause (vi) (d) of sub-rule (2) of Rule 25 of the Contract Labor (Regulation and Abolition) Central Rules, 1971, the Chief Labor Commissioner (Central), New Delhi hereby specifies the standard of construction and maintenance of the Creches as under:
- A crèche should be located within 50 meters of every establishment where 20 or more women are ordinarily employed as contract labor. The proximity should be away from obnoxious fumes, dust or odors or extremely noisy processes.
- The Creche building should be constructed of heat or cold resisting materials and should be rainproof. The height of the rooms should not be not less than 10 feet from the floor with adequate light and ventilation by free flow of air. Space should be at least 20 square feet of floor area per child. A suitable bathroom and latrine adjoining the Creche for children should be available. The number of seats in the latrine shall be at the rate of one for every 15 children. There should be separate latrines for mothers and Creche staff at a distance of not less than 50 ft from the Creche. Adequate supply of clean towels and soap should be available at the Creche.
- The building should be periodically inspected regarding safety and sanitation.
- Creche will be kept open at all times both day and night, when women employees are working.
- Wholesome drinking water should be available for the children and staff, supply of water 5 gallons per child per day. Child below 2 years of age should be fed with at least half liter of milk per child per day and arrangement for supplementary feeding.

- Convenient and suitable arrangements should be made for breastfed mothers
- There should be a kitchen attached to the Creche with cooking utensils and other facilities
- The children as well as staff of the Creche should be provided with suitable uniforms
- The Creche should have following equipment at the rate of one for each child.
  - Cradles or cots
  - Bets or mattress
  - Cotton sheets
  - Rubber sheets (children below 3 years)
  - Blankets
  - Pillows with covers.
- Every Creche should be the charge of women with midwife qualification or training as **and assisted by female ayahs.**
- The Creche should have first aid equipment kept in proper condition.
- Every child should be examined medically before admission. There should be medical
- Creche should maintain updated records and registers.

Q29. Objectives of early neonatal care.

Ans: The objectives of the early neonatal care is to assist the newborn in the process of adoption
environment, which involves:

a. Establishment and maintenance of cardiorespiratory function
b. Maintenance of body temperature by keeping the room worm, wrapping the baby with a
bathing the baby for 7 days
c. Avoidance of infection by keeping the room clean and dust free, covering the baby with
immunization, handling the baby with minimum number of care givers
d. Establishment of appropriate feeding practices which includes no prelacteal feeding,
continuation of exclusive breastfeeding, demand feeding, night feeding, no bottle feeding

Q30. Newborn care.

Ans: Breathing and clearing the air passage: Make a quick assessment to see if the baby is
respiration is established. If the baby does not cry spontaneously, clear the airways using a
gauze wrapped around index finger. Do not slap the buttocks or hold baby upside down.
flicks to the soles of the baby's feet.

Prevention of hypothermia:

Immediately after the baby is born:

- Dry the baby quickly with a warm, clean and soft and sun-dried cotton cloth
- Keeping the baby warm by placing the baby in directs skin-to-skin contact with mother
- Wrap the newborn in several layers of cotton/woolen clothing depending on the
temperature
- The room where newborn is kept must be warm enough for an adult to feel just
be free from draughts

Immediate bath can lead to hypothermia: No bath should be given to the baby until 24 hours
delivery. If baby is low birth weight (<2.5 kg) postpone the birth after 1 week.

Care of the cord:

- The cord must be left clean and dry
- Do not apply any medication or dressing over the cord stump
- Check to ensure that cord stump is not bleeding

Record birth weight within 48 hours of birth: Low birth weight <2.5 kg
- Extra care needed for low-birth weight babies between 2,000 and 2,500 g at home
- Refer babies weighing below 2,000 g

Initiate breastfeeding as early as possible:
- No prelacteal feeds (glucose water, honey, ghutti, animal milk)
- Feed colostrums which is rich in vitamins (especially vitamin A) and antibodies (baby's first immunization).
- Immediate breast feeding ensures warmth, emotional bonding, establishment of lactation, expulsion of placenta and early involution of the uterus.

Exclusive breastfeeding is to be continued for 6 months (no water is required)

Eye care:
- Clean the eyes with a soft cotton swab, using one for each eye
- Clean the eyes from the inner to outer side

Prevention of infection:
- Minimum handling of baby—clean hands and clean clothes must
- Baby will be in close contact with mother
- Persons suffering from infections of skin, respiratory tract infections or diarrheal diseases to be restricted from handling the newborn

Referral of sick newborn:
- Did not cry at birth
- Signs of respiratory distress
- Convulsions
- Lethargic and unable to suck at breast
- Deep yellow discoloration of skin particularly on first day
- Distended abdomen and repeated vomiting
- Redness surrounding umbilicus and discharge
- Any birth injury
- Any congenital malformation

Q81. India Newborn Action Plan (INAP). *(WBUHS, 2022; PBDSUHSH, 2015; MGUB, 2024; AKUB, 2023)*

Ans: India newborn action plan (INAP) developed in response to global every newborn action plan (ENAP) was launched in June 2014. The plan outlines a targeted strategy for accelerating the reduction of preventable newborn deaths and stillbirths in the country. The goal is to attain "Single Digit" neonatal and stillbirth mortality rate by 2030 in the country (SDGs).

INAP will be implemented within the existing RMNCH+A framework and guided by the principles of integration, equity, gender, quality of care, convergence, accountability and partnerships.

Six pillars of intervention include the following:
1. Preconception and antenatal care
2. Care during labor and childbirth
3. Immediate newborn care
4. Care of the healthy newborn
5. Care of small and sick newborn
6. Care beyond newborn survival

Q82. Institutional delivery can reduce maternal mortality to a great extent—Explain. *(WBUHS, 2010, 2017)*

Ans: Maternal mortality is an important burden of our country. Various types of medical and social causes are responsible for high maternal mortality in our country. Despite the advances in age, large proportion of deliveries take place at home by untrained personnel in poor hygienic condition. Prevention and treatment of important medical causes of maternal mortality can be done during institutional delivery at PHC, CHC or

higher level of health care delivery. Important medical causes of maternal mortality are hemorrhage, sepsis, hypertensive disorder of pregnancy, unsafe abortion, obstructed labor, anemia in pregnancy, etc.

- **Hemorrhage** in the form of antepartum and postpartum hemorrhage can be managed at health care facility through definitive treatment of cause and blood transfusion.
- **Sepsis** can be prevented by institutional delivery by trained personnel maintaining 7 cleans and medical management of sepsis can be done by antibiotic. Surgical management of sepsis can be done at FRU.
- **Hypertensive disorder of pregnancy** like preeclampsia can be managed by suitable antihypertensive and for management of eclampsia, anticonvulsant, magnesium sulfate is available at health centers.
- **Safe abortion** facility is available in all CHCs and 50% of PHC through manual vacuum aspiration, other medicinal preparations.
- **Obstructed labor** can be prevented and managed by injection oxytocin/other oxytocics.
- **Severe anemia** can be managed by blood transfusion. For this purpose, blood storage units are established at CHC level. **In such a way, institutional delivery can reduce maternal mortality.**

Q33. Growth and development are not synonymous—explain. *(WBUHS, 2016)*

Ans: The term growth refers to increase in physical size of the body and development to increase in skills and functions. Growth and development are considered together because the child grows and develops as a whole. Growth and development include not only physical aspect but also intellectual, emotional and social aspects. Normal growth and development take place only if there is optimum nutrition, if there is freedom from recurrent episodes of infections and freedom from adverse genetic and environmental influences. MCH care is concerned with the process of physical and psychological growth and development of the child which is crucial for health or ill-health for life and death.

So, growth and development are not synonymous, but they are considered together.

Q34. Kangaroo mother care (KMC). *(WBUHS, 2012; ABKUB, 2015; GITAMAP, 2023; KIMS, 2023; MU, 2023; MGUB, 2024)*

Ans: **Kangaroo mother care (KMC)** for low-birth-weight babies was introduced in **Columbia** in 1979 by **Dr Hector Martinez and Edgar Rey** as response high infections and high mortality rate of mother due to overcrowding in the hospitals.

Afterwards, it was adopted by the developing world and became the essential element in the continuum of neonatal care.

It is the care provided by recently delivered mother to her low-birth-weight newborn baby, by placing the baby in between her breasts, in direct skin to skin contact and serves as a natural and best incubator, like the animal kangaroo, keeping the young one in pouch.

KMC is a scientifically proved, comprehensive, humane and low-cost method of providing care for those low birth weight babies, who are hemodynamically stable, weighing between 1,800 to 2,000 grams.

KMC is scientifically proved in that it is highly superior to the existing sophisticated technologies available. KMC is comprehensive in that it provides warmth, promotes growth, and protects from infection.

KMC is a low-cost method in that absolutely it does not require any investment like incubator. Thus, KMC is an early, prolonged, continuous skin-to-skin contact between mother and low birth weight newborn both in the hospital and at home after discharge with regular follow-up.

Benefits of KMC

Benefits to the baby:

- Baby is kept warm in all the 24 hours by the mother.
- It gains physiological stability.
- It is at a reduced risk of nosocomial infection because of early discharge.
- Early growth is promoted.

Benefits to the mother:

- Mother becomes actively involved in taking care of the child.
- Mother is relaxed, confident and empowered.

- Bonding is better established between mother and the baby.
- Breastfeeding becomes successful.

Benefits to the family:

- It is economical compared to the cost of intensive care.
- Father can return to the work early.
- It facilitates bonding among the family members.

Benefits to the hospital: It saves materials like incubators, oxygen cylinder, saves manpower in terms of nursing staffs and other health personnel, saves money also.

Parameters to be monitored during KMC:

- **Temperature**—once in 6 hours.
- **Respiration**—for apnea.
- **Feeding**—once in 90–120 minutes.
- **Well-being**—by educating the mother about danger signs.
- **Growth**—gain of weight of 15–20 g/kg/day.

Q35. What is rooming-in? *(RGUHS, 2007; TDMGRMU, 2008, 2013)*

Ans: Rooming in is keeping the baby close to mother's bed. It is one of the important components of intranatal care.

Advantages:

- It gives an opportunity to know his/her mother
- Promotes early initiation of breastfeeding
- Removes fear of mother about safety and misplacement of child in central nursery
- It builds up confidence in mother

Q36. Juvenile delinquency and it social and environmental causes *(WBUHS, 2013, 2015; VKSUAB, 2018; RGUHS, 2010, 2013, 2015; SAMU, 2011; TDMGRMU, 2012, 2016; KIMS, 2015, 2023; SSUHSA, 2010; RUJH, 2010; 2023; SDVPG, 2023; AKUB, 2023)*

Ans: Juvenile delinquency embraces deviation of normal youthful behavior and includes incorrigible, ungovernable, habitually disobedient, those who deserts their home, mixes with immoral people, those with behavioral problem and commits antisocial practices. Juvenile means a boy who has not attained the age of 16 years and a girl who has not attained the age of 18 years.

Causes:

- **Biological causes:**
  - Physical defect
  - Hereditary defect
  - Glandular imbalance
  - XYY chromosome
- **Social causes:** Broken family due to loss of one or both of the parents, stepmother, large family size, poverty, illiteracy, improper child care.
- **Environmental and other causes:**
  - Lack of recreation
  - Cheap recreation
  - Sex thriller
  - Urbanization
  - Industrialization
  - Slum dwellers

Preventive measures:

- **Improvement of family life:** A well-adjusted family can stem the tide of delinquency. Parents should be prepared for parenthood. The needs of the children should be appreciated and met.

- **Schooling:** The school comes next to the home in the community in ordering the behavior of children. There should be a healthy-teacher pupil relationship. The school teacher can play an important part in detecting early signs of maladjustment.
- **Social welfare services:** It includes provision of recreation facilities, parent counseling, child guidance clinic, educational facilities and adequate general health services.

Q37. What is child placement? *(RGUHS, 2003; MUHS, 2019)*

Ans: Child placement is a social measure for the under privileged children or juvenile delinquent of the society or to give them a chance for a better living and bright future.

The institution where the child is placed

- Orphanages
- Foster homes
- Adoption
- Borstals
- Remand homes

Q38. Child trafficking. *(ABKUB, 2018)*

Ans: Child trafficking is the recruitment, transportation, transfer, harboring or receipt of a child for the purpose of exploitation. A child trafficker is anyone who contributes to an element of the trafficking process with the intent to exploit the child. This included those who play only a part in the entire process, such as recruiters, intermediaries, document providers, transporters, corrupt officials, service providers and unscrupulous employers. Girls are trafficked disproportionately for commercial sexual exploitation and child domestic labor. The ILO 2005 Global report estimates that Asia has the highest number of child trafficking victims followed by industrialized countries, Latin America and Caribbean, and the Middle East Countries.

The key elements of a protective environment include:

- Strengthening the capacity of families and communities to care for and protect children
- Government commitment to child protection by providing budgetary support and social welfare policies targeted at the most excluded and invisible children
- Ratification and implementation of legislation, both national and international, concerning children's rights and protection
- Prosecution of perpetrators of crimes against children, and avoidance of criminalizing child victims
- An open discussion by civil society and the media of attitudes, prejudices, beliefs and practices that facilitate or lead to abuses
- Ensuring that children know their rights, are encouraged to express them and are given vital life skills and information to protect themselves from abuse and exploitation
- Availability of basic social services to all children without discrimination
- Monitoring transparent reporting and oversight of abuses and exploitation

Ujjawala: "Ujjawala", a comprehensive scheme to combat trafficking was launched in India by the Ministry of Women and Child Development on 4th December 2007 and is being implemented mainly through NGOs. The scheme has five components of prevention, rescue, rehabilitation, reintegration and repatriation of victims trafficked for commercial sexual exploitation.

CM10.2: Enumerate and describe the methods of screening high-risk groups (pregnant mother).

Q39. Enumerate and describe the methods of screening high-risk groups (pregnant mother).

Ans: The high-risk pregnant mothers are discussed below: *(MGUB, 2022; 2023; NU, 2015; VKSUAR, 2021; KIMS, 2019; DBRAUA, 2021)*

The central purpose of antenatal care is to identify **"high risk"** cases (as early as possible) from a large group of antenatal mothers and arrange skilled care for them as well as providing appropriate care for all mothers.

"Risk approach" help in reducing maternal and infant mortality.

Those mothers are categorized in four groups:

Group I: Pregnant mother's profile

- Too young mothers (<18 years)
- Too old mothers (>30 years and above)
- To obese mothers
- Too short mothers (<140 cm and below)
- Too many previous pregnancies (Grand Multipara ≥ 5 births)
- Too frequent pregnancies

Group II: Pregnant mothers with previous history of reproductive wastage

- History of three or more spontaneous consecutive abortions
- Stillbirth
- Neonatal death
- Monsters

Group III: Pregnant mothers with bad obstetric history

- Malpresentations, viz breech, transverse lie, etc.
- Prolonged third stage of labor
- Twins, hydramnios
- History of previous cesarean or instrumental delivery
- History of previous prolonged pregnancy (14 days after expected date of delivery)
- Toxemia
- Antepartum hemorrhage or threatened abortion
- Anemia

Group IV: Pregnant mothers with systemic disorders/health related issues

- Hypertension
- Diabetes mellitus
- Cardiovascular diseases
- Respiratory illness
- Kidney disease
- Epilepsy/Convulsion/CNS disorder
- Thyroid disfunction
- Pre-eclampsia and eclampsia
- HIV/RTI/STI
- Treatment for infertility

Antenatal care package provides relevant services for monitoring the progress of fetal growth and well-being of mother. It includes screening of high-risk/complicated pregnant women and their timely management. These services are universally available through the public health system both at outreach and health facility. The package of services is discussed below:

- Minimum of 4 ANC visits including early registration and 1st one preferably in 1st trimester
- IFA tablets for anemia prophylaxis and treatment
- 2 Td/TT injections/booster dose for prevention of maternal and neonatal tetanus
- Deworming with albendazole after 1st trimester
- Universal testing for syphilis, HIV, Hepatitis B and Malaria to eliminate those disease in newborn to prevent parent to child transmission
- Monitoring fetal growth in every ANC visit
- Screening and tracking of HRGs for complications like anemia, hypertension, pre-eclampsia, diabetes, hypothyroidism, hepatitis B, malpresentation and other diseases
- Counseling for birth and emergency preparedness, newborn care, breastfeeding, spacing of births and limiting family size

- Supplementary nutrition through ICDS program and one extra meal at home
- Prevention of Rh disease using anti-D immunoglobin

Method of screening: Universal screening and tracking of every pregnancy by:

- Confirming pregnancy by pregnancy test kit
- Ascertain if pregnancy is wanted/unwanted
- Past obstetric history like complications in Cesarian section, repeated abortions, stillbirth, neonatal death and any other disease and congenital abnormality, etc.
- General physical examination for detecting anemia, swelling of feet, weight, height and blood pressure of pregnant mother
- Abdominal examination for fundal height, presentation, fetal heart sounds and twin pregnancy
- Universal laboratory testing for HIV/Syphilis, hemoglobin to detect anemia, urine test for albumin and sugar, blood test for gestational diabetes, hepatitis B, malaria, hypothyroidism and blood group and Rh factors. Ultrasonography is done to detect congenital abnormality.
- Pregnant women are considered to be high risk if there is bad obstetric history, height is less than 140 cm, blood pressure above 140/90 mmHg, severe anemic Hb is less than 7 g/dL, gestational diabetes, positive for HIV and excessive or poor weight gain
- Complications can arise any time during pregnancy, labor, delivery and also after delivery, hence arrangement for referral is a mandatory
- If these risk factors are taken into account, then more than 90% of pregnant women in India are at risk. Therefore, risk approach does not have any focus action, hence each and every mother needs professional care without exception

Some initiatives:

- Screening for gestational diabetes and hypothyroidism
- **Weight gain:** About 9–11 kg weight gain during pregnancy. Less weight gain means IUGR and excess weight gain means pre-eclampsia or twins.
- **Anemia control—prophylaxis and treatment:** 180 IFA tablets for anemia prophylaxis started from the fourth month of pregnancy and continued another 180 days after delivery. Through Anemia Mukt Bharat initiative along with advice for iron rich foods.
- **Management of severely anemic pregnant women (Hb less than 7g/dL):** Severe anemia is a risk factor for PPH and other infections. So, line listing, tracking a management during pregnancy should be done by ANM supported by nodal officers in the catchment area. In the malaria endemic areas, there is provision for providing long lasting insecticide treated bed nets (LLINs) under NVBDCP.
- **Calcium and vitamin supplementation:** All pregnant and lactating women are provided with 1,000 mg of calcium for prevention of pre-eclampsia, preterm births and hypertensive disorders. They are also being provided with vit C and vit B_{12} supplement, to tackle the problem of anemia.
- **Deworming:** PW are provided with 400 mg of Albendazole after 1sr trimester.
- **Preventive use of folic acid:** For prevention of neural tube defects, use of 400 µg folic acid 3 months before the conception.
- **Kilkari:** Weekly audio messages to pregnant women and parents of infants, besides SMS messages sent through MCTS, to educate and update on recommended practices/requirements.
- **Mother and child tracking system (MCTS)/RCH Portal:** It is a name-based web service that includes details of every pregnant woman, neonate and child till the age of 5 years and the aims to ensure every pregnant women gets complete and quality ANC, Natal, PNC and FP services, complete immunization services for every child.
- **Safe delivery:** Should focus on institutional delivery and all deliveries are attended by skilled birth attendants.

Q40. "At risk" infants. *(BNMUB, 2014; PBDSUHSH, 2013; RGUHS, 2009; TDMGRMU, 2015; GNSU, 2021)*

Ans: The number of infants in a community or attending a child health clinic may be so large that it may not be possible to give sufficient time and attention to all of them.

The children who should be given due attention if the following conditions are seen in any of the children are at risk for poor prognosis:

- Birth weight less than 2.5 kg
- Twins
- Birth weight 5 and above
- Artificial feeding
- Weight below 70% of the expected weigh (i.e., II and III degrees of malnutrition)
- Failure to gain weight during three successive mothers
- Children with PEM, diarrhea
- Working mother/one parent

Q 2: Describe Rashtriya Bal Swasthya Karyakram (RBSK) and screening of high-risk children (newborn and children of 0–18 years).

Describe Rashtriya Bal Swasthya Karyakram (RBSK) and screening of high-risk children.
(MGUB, 2023, 2024)

Ans: RBSK is a new initiative launched in February 2013. It includes provision for Child Health Screening and Early Intervention Services **(Table 10.1)** through early detection and management of 4 Ds—**defects at birth, diseases in children, deficiency conditions and development delays including disabilities**. An estimated 27 crore children in the age group of 0–18 years are expected to be covered across the country in a phased manner.

Child Health Screening and Early Intervention Services under NRHM envisage to cover 30 identified health conditions for early detection, free treatment and management. Based on the high prevalence of diseases like hypothyroidism, sickle cell anemia and beta thalassemia in certain geographical pockets of some states/UTs, and availability of testing and specialized support facilities, these states and UTs may incorporate them as part of the initiative.

Table 10.1: Identified health conditions for child health screening and intervention services.

Defects in birth	*Deficiencies*	*Childhood diseases*	*Developmental delays and disabilities*
• Neural tube defect • Down's syndrome • Cleft lip and palate/cleft palate alone • Talipes (club foot) • Developmental dysplasia of the hip • Congenital cataract • Congenital deafness • Congenital heart diseases • Retinopathy of prematurity	• Anemia especially severe anemia • Vitamin A deficiency (Bitot's spots) • Vitamin D deficiency (rickets) • Severe acute malnutrition • Goiter	• Skin conditions (scabies, fungal infection and eczema) • Otitis media • Rheumatic heart disease • Reactive airway disease • Dental caries • Convulsive disorders	• Vision impairment • Hearing impairment • Neuromotor impairment • Motor delay • Cognitive delay • Language delay • Behavior disorder (Autism) • Learning disorder • Attention deficit hyperactivity disorder • Congenital hypothyroidism, sickle cell anemia, beta thalassemia (optional)

Program implementation:

- **For newborn:**
  - Facility-based newborn screening at public health facilities by existing health manpower.
  - Community-based newborn screening at home through ASHAs for newborn till 6 weeks of age during home visits.
- **For children 6 weeks to 6 years:** Anganwadi center-based screening by dedicated mobile health teams.
- **For children 6 to 18 years:** Government and government aided schools-based screening by mobile health teams.

Facility base newborn screening:

- This includes screening of births defects in institutional deliveries at public health facilities, especially at the designated delivery points by ANMs, medical officers/gynecologists.
- Existing health service providers at all designated delivery points will be trained to detect, report and refer birth defects to the District Early Intervention Centers in District Hospitals.

Community-based newborn screening (0–6 weeks) for birth defects: Accredited Social Health Activists (ASHAs) during home visits for newborn care will use the opportunity to screen the babies born at home and the institutions till 6 weeks of age. ASHAs will be trained with simple tools for detecting gross birth defects. ASHAs will mobilize caregivers of children to attend the local Anganwadi Centers for screening by the dedicated mobile health team. For performing the above additional tasks, she would be equipped with a tool kit consisting of a pictorial reference book having self-explanatory pictures for identification of birth defects. Suitable performance-based incentive may also be provided to ASHAs. In order to ensure improved outcome of the screening program by mobile health teams, ASHAs will give priority to the children with low birth weight, any chronic illness (e.g., tuberculosis, HIV, hemoglobinopathy, etc.). Line lists maintained by the ANMs and AWWs would also be used to mobilize children.

Screening of children aged 6 weeks till 6 years attending Anganwadi centers: Children aged 6 weeks to 6 years will be examined in the Anganwadi centers by dedicated mobile health teams.

Screening of children enrolled in government and government aided schools: For children in the age group of 6 to 18 years who will be screened in government and government-aided schools, the block will be the hub of activity for the program. At least two dedicated mobile health teams in each block will be engaged to conduct screening of children. Villages within the jurisdiction of the block would be distributed among the mobile health teams. The number of teams may vary depending on the number of Anganwadi Centers, difficult-to-reach areas, and children enrolled in the schools. The screening of children in the Anganwadi Centers would be conducted at least twice a year and at least once a year for school children to begin with.

CM10.6: Enumerate and describe various family planning methods, their advantages and shortcomings.

Q41. Classify contraceptives methods. Discuss the advantages and disadvantages of them.
(WBUHS, 2020, 2021; BNMUB, 2015, 2016, 2017, 2021; RGUHS, 2008; TRIU, 2022; GOAU, 2023; GNSUB, 2023; SSUHSA, 2024; DBRAUA, 2024)

Ans: The **contraceptive methods** are broadly classified into two groups:

A. **Spacing methods:** *(ABKUB, 2024)*
- Barrier methods
  - Physical methods
  - Chemical methods
  - Combined methods
- Hormonal methods
- Intrauterine devices
- Postconceptional methods
- Miscellaneous

B. **Terminal methods:**
- Male sterilization
- Female sterilization

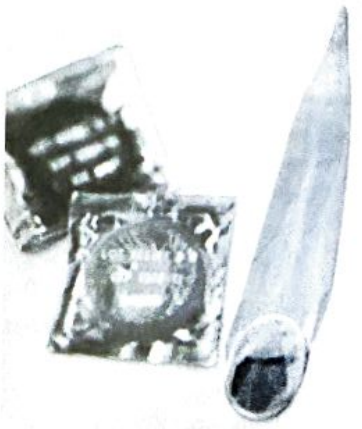


Fig. 10.4: Male condom

Male condom *(BNMUB, 2002; RGUHS, 2008; SSUHSA, 2017)*

Condom **(Fig. 10.4)** is the most widely known and used as a barrier device throughout the world. Condoms are mostly made from latex rubber or polyurethane. Its length is 15–20 cm, diameter 3–3.5 cm, thickness 0.03–0.07 mm, cylindrical, one end is closed and other end with inbuilt rim. They are available in various colors and shapes. They may be lubricated, provided with spermicidal jelly. Individual condom is packed, rolled and sealed in aluminum or plastic foil packs with expiry date. It is supplied by government of India free of cost in the brand name as Nirodh. Apart from that condom is available in vending machine. The condom is fitted on the erect penis before intercourse. The air must be expelled from the teat end to make room for the ejaculate. The condom must be held carefully when withdrawing it from vagina to avoid spilling seminal fluid into the vagina after intercourse and should be disposed in a correct

way. A new condom should be used for each and every sexual act. It should be kept in mind that correct and consistent use is very important.

Advantages of condom	*Disadvantages of condom*
They are easily available	It may slip off or tear during coitus due to incorrect use
Safe and inexpensive	It may interfere with sex sensation
Easy to use, do not require medical supervision	Condom requires high motivation
Light, compact, disposable	Failure rates 2–3/HWY
No side effect	
Provides protection not only against pregnancy but also again STIs	

Female condom:

The female condom **(Fig. 10.5)** is made of polyurethane, looks like cylindrical sheath with two rings on both ends, closed and open. An internal ring in the closed end of the pouch covers the cervix and open ring lies outside the vagina. It is prelubricated with dimethicone. It is 17 cm long and 7 cm diameter (larger diameter than male condom). Female condom and male condoms should not be used together, as there may be slip, displacement, more breakage.

Fig. 10.5: Female condom.

Advantages of female condom	*Disadvantages of female condom*
It prevents pregnancy by preventing sperms not in contact with female genital tract	It is expensive, availability
It prevents STIs including HIV, CMV and Hepatitis B virus	Woman needs motivation and she should acquire the technique of use
It is a method under woman's control	Slippage is more, sometimes penis may go outside the condom into vagina
	Failure rate in typical users are 21/HWY in perfect users are 5/HWY. Failure rate is higher than male condom

(RGUHS, 2008)

Q42 Social marketing of condoms.

Ans: Social marketing of condoms is a component of condom promotion by NACO.

Objectives: To increase the acceptability and availability of condoms.

Strategy:

- Social advertisement
- Providing easy access to condom
- Improved sustainability in condom provision.

Advantages:

- It is the most effective contraceptive for controlling STIs as well as HIV/AIDS if used correctly and consistently.
- It also prevents unwanted pregnancy, thus reduce fear and enhancing the pleasure associated with sex.

- **Disadvantage:** Market research is required as the target groups for condom promotion for disease protection and family planning are different.
- **Significance:** Social marketing has been accepted as the most effective strategy for condom promotion.

Q43. What do you mean by conventional contraceptives? Enumerate different types of these devices and write down advantages and disadvantages of each method. *(RGUHS, 2008; TDMC&MU 2012; SSUHSA, 2013, 2022; NU 2014)*

Ans: Conventional contraceptives: These are the contraceptive methods that are required at the time of sexual intercourse. Examples are condom, spermicides and diaphragm, etc.

Condom: Advantage and disadvantages already discussed

Spermicides: Spermicides (vaginal chemical contraceptives) were used widely in 1960. They comprise of four categories:

1. **Foams:** Foam tablets, foam aerosols
2. Creams, jellies and pastes squeezed from a tube
3. **Suppositories:** Inserted manually
4. **Soluble films:** C film inserted manually

The commonly used modern spermicides are surface acting agents which attach themselves to spermatozoa and inhibits oxygen uptake and kills sperms.

Advantages:

- Free from potential toxicity
- No inflammatory or carcinogenic effect on vaginal skin or cervix

Disadvantages:

- These should be used almost immediately before intercourse and repeated before each and every intercourse. This motivation is required to the highest level
- They must be introduced into those regions of vagina where sperms are likely to be deposited
- They may cause mild burning or irritation
- They are best used in conjunction with barrier methods
- They have high failure rate
- Concern about possible teratogenic effects on fetus

Diaphragm: It is a vaginal barrier. It was invented by a German physician.

Diaphragm is inserted before sexual intercourse and must remain in place for not less than 6 hours after sexual intercourse. A spermicidal jelly used along with the diaphragm. The failure rate is very high, between 6–12 per 100 women years.

Advantage: Almost total absence of risks and no medical contraindications

Disadvantages:

- Initially a physician or other trained person will be needed to demonstrate the technique of inserting it
- After delivery, it cannot be used before involution
- Privacy has to be maintained during insertion, washing and storage especially for rural females
- If it is placed for extended period inside the vagina, there is a remote **possibility of toxic shock syndrome**

(RGUHS, 2014)

Q43a. Types of oral contraceptive pills [OCP]

Ans: 1. Combined pills
2. Nonsteroidal pills
3. Progestogen only pills
4. Postcoital pills
5. Once a month (long acting) pill
6. Male pill

Combined pills: The Department of Family Welfare, Government of India has made available two types of low dose oral contraceptive pills under the brand name of **MALA-N and MALA-D**. It is a package of 28 pills which contain 21 active (hormonal) pills composed of **Levonorgestrel 0.15 mg and Ethinyl estradiol 0.03 mg** and 7 inactive (nonhormonal) brown film coated 60 mg **Ferrous fumarate** tablets for continuation of full cycle. **Mala-N** is supplied **free of cost** through all PHCs and urban family welfare center and other health facilities. **Mala-D** is available to the consumer under **social marketing** at a minimum price fixed by the Department of Family Welfare, Government of India.

Q43b. How to administer the pills?

Ans: If she is starting within 5 days after the start of her monthly bleeding, no need for a backup method. If it is more than 5 days after the start of her monthly bleeding, she can start COP any time it is reasonably certain she is not pregnant. She will need a backup method for the first 7 days of taking pills.

The pill should be started orally for consecutive 21 days and followed by next 7 days one iron tablet every day (the pack usually has 7 such tablets), during this period "withdrawal bleeding" occurs. Again, start from a new pack and continue in the same manner. **The pill should be taken every day at a fixed time, preferably before going to bed at night (Figs. 10.6 and 10.7).**

Fig. 10.6: Combined pills.

Fig. 10.7: Specimen of combined pills.

Q43c. Management of missed pills.

Ans:

Missed pills	When to take	How to continue	Back up methods used
1 or 2 pills in the 1st week	Take the missed pills as soon as she remembers	Continue the scheduled pill	Not required
	If she takes the missed pill after 12 hours	Continue the scheduled pill	Use condom for 1st 7 days
3 or more pills in 1st 14 days	Take 1st pill as soon as possible	Continue the scheduled pill	Use condom for 1st 7 days/ consider emergency contraceptive if had sex in last 72 hours
3 or more pills in 3rd week	Take 1st pill as soon as possible	Continue the hormonal pills as scheduled. Discard the non-hormonal pills. Start a new pack in the very next day	Use condom for 1st 7 days/ consider emergency contraceptive if had sex in last 72 hours
Missed any non-hormonal pill	Discard the missed pill	Continue the scheduled pill. Start the new pack as usual	Not required

Q43d. The mode of action of oral contraceptive pills:

Ans:
- Combined oral pill (COPs) act by inhibiting ovulation and interfering with tubal motility.
- Estrogen inhibits FSH increase, and progesterone inhibits LH surge. It causes atrophy of endometrium, thereby preventing implantation. It also causes thickening of cervical mucus making it viscous and tenacious preventing sperm penetration.

Advantages of OCP	*Disadvantages of OCP*
They are easily available	Cardiovascular effects like myocardial infarction, cerebral thrombosis, venous thrombosis, etc.
Safe and inexpensive	Metabolic effects like elevation of blood pressure, alteration of serum lipids with a particular effect on decreasing HDL, modification of carbohydrate metabolism with elevation of blood glucose and plasma insulin
Easy to use, do not require medical supervision	Liver disorder-Hepatocellular adenoma, gallbladder disease, cholestatic jaundice
Apart from contraceptive benefits, it may provide protection against other diseases like benign breast disease including fibrocystic disease of breast and fibroadenoma, ovarian cyst ovarian cancer, iron deficiency anemia, pelvic inflammatory diseases and ectopic pregnancy	Effect on lactation-Estrogen content affects quantity and constituents of breast milk and less frequently causes premature cessation of lactation
	Breast tenderness, fullness, discomfort
	Weight gain
	Headache and migraine
	Bleeding disturbances - A small minority of women using oral contraceptive may complain break-through bleeding or spotting in the early cycles
	Delay in subsequent fertility

Q43e. Contraindication of oral pills.

Ans:

Absolute	*Special*
Cancer of the breast and genitals	Age above 40 years
Liver disease	Smoking and age above 35 years
Previous and present history of thromboembolism	Mild hypertension
Cardiac abnormalities	Chronic renal disease
Congenital hyperlipidemia	Epilepsy
Undiagnosed abnormal uterine bleeding	Migraine
	Lactating mothers in first 6 months
	Diabetes mellitus
	Gallbladder disease
	History of infrequent bleeding
	Amenorrhea

(RGUHS 2014)

Q44. Noncontraceptive benefits of oral contraceptives.

Ans: Regularization of irregular menstrual cycle especially in Stein-Leventhal syndrome (PCOD).
Reduced incidence or improvement in the following conditions:

- Dysmenorrhea
- Anemia
- Acne
- Hirsutism
- Ectopic pregnancy
- Benign breast disease
- Endometrial cancer

- Ovarian cysts
- Ovarian cancer
- Colorectal cancer
- Osteoporosis

Q45. Knowledge of contraceptives among adolescents. *(ABKUB, 2018)*

Ans: A cross-sectional study was conducted in the Government College, Gangtok, Sikkim to evaluate the knowledge, attitude and practice of contraception among 156 students (adolescents) enrolled in the first-year bachelor course. The study revealed that 98% (153/156) of the students had knowledge about family planning and 86% (134/156) of them had heard about contraceptives. Most of them knew about condoms (85%) and contraceptive pills (40%) but knowledge about permanent methods and Cu-T was poor about 12%. Most students thought contraceptives were to be used to prevent unwanted pregnancy (35%) and for birth spacing (30%). 11% of students had used some form of contraceptive in the past and 7% were currents users. The most commonly used contraceptives were condoms, followed by combined use of OCP and condoms.

A community-based cross-sectional study conducted among school-going 500 adolescent girls in the field practice area of Urban Health Training Center, Tripuri, Government Medical College, Patiala (Punjab). A survey was conducted to collect the information on demographic characteristics and knowledge and perceptions about safe sex. The study revealed that only 39.71% of girls were aware that the legal age of marriage of girls in India is 18 years. About 22% of girls said that they would prefer to have premarital sex and majority of them belonged to nuclear families. Around 38.4% of girls knew that condom is the safest contraceptive method but a preferred choice of contraceptive method among the girls for condoms (24.40%), oral pills (20.20%), and emergency pills (19.60%).

Q46. Newer contraceptives. *(WBUHS, 2022; AKUB, 2022)*

Ans: Centchroman: Centchroman is a nonsteroidal and nonhormonal oral contraceptive pill. It contains ormeloxifene developed by the Central Drug Research Laboratory, Lucknow, India. It is marketed under the brand names as "Saheli". It is supplied by Government of India in a pack of OCP containing **8 tablets in the name of "Chhaya" (Fig. 10.8)** recently. Each tablet contains 30 mg **Ormeloxifene.**

- **Intake schedule:** One pill is taken orally twice a week for the first 3 months followed by once in a week. 1st pill is started from 1st day of period and second pill after 3 days. It is advised to use barrier method for the initial 2 months.
- **Mechanism of action:** It works by preventing implantation. It has no antiovulatory effect. It acts as selective estrogen receptor modulator.

Fig. 10.8: Chhaya.

- **Side-effects:** It is relatively safe, delayed period in few women, fertility typically returns within 1 month after discontinuation.
- **Contraindications:** It is contraindicated in lever and renal disorder.
- **Failure rate:** With perfect use 1-2 HWY.

Q47. Hormonal contraceptives. *(ABKUR 2018; BUHS 2018; [illegible])*

Ans: Hormonal contraceptives when properly used are the most effective spacing methods in [illegible]. Oral contraceptives of combined type are almost 100% effective in preventing pregnancy. They [illegible] best means of ensuring spacing between one childbirth and another. More than 65 million in the world estimated to be taking pill of which about 9.52 million estimated to be in India.

Classification: Hormonal contraceptives currently in use and or under study may be classified as follow:

A. **Oral pills:**
- Combined pills
- Progestogen only pill
- Postcoital pill

B. **Depot (slow release) formulations:**
- Injectables (DMPA, NET-EN, DMPA-SC)
- Subcutaneous implants:
  - Norplant long-acting contraceptive: It consists of six silastic (silicone rubber) capsules [illegible] 35 mg each Levonorgestrel.
  - Administration: The silastic capsules or rods are implanted beneath the skin of the [illegible] arm.
    Effective contraception is provided for over 5 years. The contraceptive action of Norplant is reversible removal of capsules.
- Vaginal ring, contain Levonorgestrel

C. **Third generation IUD with progestasert:** T-shaped device filled with 38 mg of progesterone.

Q48. Injectable contraceptives. *(WBUHS 2019, 2022; SMU 2014, 2015; [illegible])*

Ans: These are highly effective, reversible, long acting and estrogen free spacing methods in injectable form. There are two types of injectable contraceptives are available:

A. **Progesterone only injectables found suitable, reliable, they are:**
- DMPA (Depot medroxy progesterone acetate)
- NET-EN (Norethisterone enanthate)
- DMPA-SC

B. **Combined injectable contraceptives**

DMPA: Standard dose is an intramuscular injection of 150 mg every 3 months. The initial injection should be given during 5th day of menstrual period to rule out pregnancy. Deep intramuscular injection into gluteus maximus. The injection site never be massaged following injection. It gives protection from pregnancy in 99% of women for at least 3 months. This contraceptive should be used among multipara of age over 35 years who already completed their family.

- **NET-ET:** It is given intramuscularly at a dose of 200 mg in every 60 days. The initial injection should be given during 5th day of menstrual period to rule out pregnancy. Deep intramuscular injection into gluteus maximus. The injection site should never be massaged following the injection.
- **Failure rate**: 0.4%
- **DMPA-SC:** A new low dose formulation of DMPA, it contains 104 mg DMPA at 3 months interval, it is given in upper thigh or abdomen subcutaneously.
- **Combined injectable contraceptives:** It contains progestogen and estrogen; it is given at a monthly interval.

- **Side-effects:** It is relatively safe, delayed period in few women, fertility typically returns within 6 months after discontinuation.
- **Contraindications:** It is contraindicated in lever and renal disorder.
- **Failure rate:** With perfect use 1-2/HWY.

Q37. Hormonal contraceptives. *(ABKUB, 2018; RUJH, 2018; GITAMAP, 2023)*

Ans: Hormonal contraceptives when properly used are the most effective spacing methods of contraception. Oral contraceptives of combined type are almost 100% effective in preventing pregnancy. They provide the best means of ensuring spacing between one childbirth and another. More than 65 million in the world are estimated to be taking pill of which about 9.52 million estimated to be in India.

Classification: Hormonal contraceptives currently in use and/or under study may be classified as follows:

A. **Oral pills:**
- Combined pills
- Progestogen only pill
- Postcoital pill

B. **Depot (slow release) formulations:**
- Injectables (DMPA, NET-EN, DMPA-SC)
- Subcutaneous implants:
  - Norplant long-acting contraceptive: It consists of six silastic (silicone rubber) capsules of containing 35 mg each Levonorgestrel.
  - Administration: The silastic capsules or rods are implanted beneath the skin of the forearm or upper arm.
    Effective contraception is provided for over 5 years. The contraceptive action of Norplant is reversible on removal of capsules.
- Vaginal ring, contain Levonorgestrel

C. **Third generation IUD with progestasert:** T-shaped device filled with 38 mg of progesterone.

Q42. Injectable contraceptives. *(WBUHS, 2019, 2022; SMU, 2014, 2015; NU, 2015)*

Ans: These are highly effective, reversible, long acting and estrogen free spacing methods in injectable form. There are two types of injectable contraceptives are available:

A. **Progesterone only injectables found suitable, reliable, they are:**
- DMPA (Depot medroxy progesterone acetate)
- NET-EN (Norethisterone enanthate)
- DMPA-SC

B. **Combined injectable contraceptives**

DMPA: Standard dose is an intramuscular injection of 150 mg every 3 months. The initial injection should be given during 5th day of menstrual period to rule out pregnancy. Deep intramuscular injection into gluteus maximus. The injection site never be massaged following injection. It gives protection from pregnancy in 99% of women for at least 3 months. This contraceptive should be used among multipara of age over 35 years who already completed their family.

- **NET-ET:** It is given intramuscularly at a dose of 200 mg in every 60 days. The initial injection should be given during 5th day of menstrual period to rule out pregnancy. Deep intramuscular injection into gluteus maximus. The injection site should never be massaged following the injection.
- **Failure rate**: 0.4%
- **DMPA-SC:** A new low dose formulation of DMPA, it contains 104 mg DMPA at 3 months interval. It is given in upper thigh or abdomen subcutaneously.
- **Combined injectable contraceptives:** It contains progestogen and estrogen; it is given at a monthly interval.

Fig. 10.9: Specimen of Copper–T.

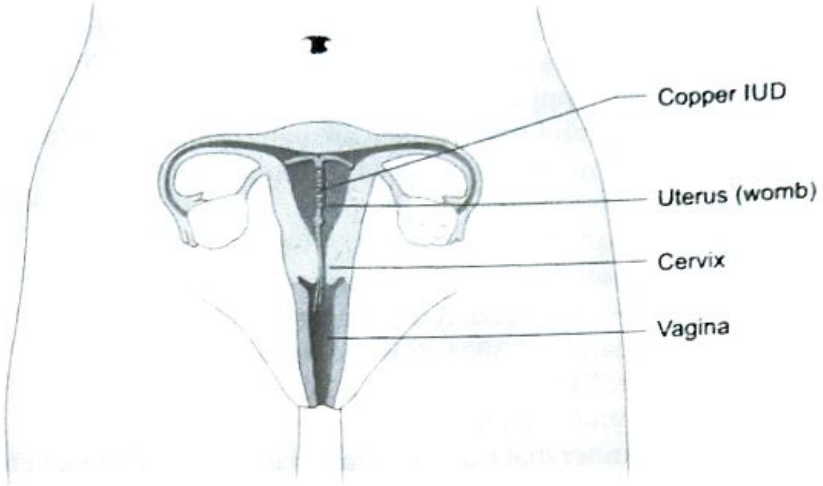


Fig. 10.10: Copper-T situ.

- **Subdural implants:** Norplant is long-term contraceptives consisting of 6 silastic (silicone rubber) capsules containing 35 mg each Levonorgestrel. Norplant-2 a newer device comprises of 2 small rods of Levonorgestrel.

Implanted beneath the skin of forearm or upper arm. Effective contraception is provided for 5 years and also reversible on removal.

Intrauterine devices (IUDs) *(BNMUB, 2021; SSUHSA, 2022; YSRUHSAP, 2021; KIMS, 2019)*

Types of IUD: There are two basic types, nonmedicated and medicated, both are usually made of polyethylene or other polymers. In addition, medicated or bioactive IUDs release either metal ions (copper) or hormone (progestogens).

First generation IUDs (nonmedicated): It comprises the inert or nonmedicated devices usually made of polyethylene or other polymers. It has different shapes and sizes like loops, spirals, coils, rings, etc. Among all models, Lippes is popular that time.

A. **Lippes loop:** It is double S-shaped device made of polyethylene (a plastic material). Also contains small amount of barium sulfate to allow X-ray observation. Once it is popular but not used in India from 80s and is gradually being replaced by medicated IUD throughout the world.

B. **Second generation IUDs (use of copper): Copper-T:** A new approach was tried in the 1970s by adding copper to IUD. It was found that metallic copper had a strong antifertility effect. By addition of copper the device has become smaller, can be easier to fit even in nulliparous women. Many copper bearing devices are available in the market.

The number in the name of the device indicates the surface area of the copper in square mm on the device. Copper T 380 Ag are distinguished by a silver core over which the copper wire is wrapped.

- Copper-T/Copper containing IUD
- Example: Copper T200, Copper T380A, Copper T380 Ag
- Multiload Copper 250 and Multiload Copper 375

Copper T380A: It is a T shaped Cu containing IUD with a stem wrapped with 314 mm^2 of fine copper wire (approximately 175 mg) and each arm has a 33 mm^2 copper sleeve (66.5 mg of cupper each arm) with a total of 380 mm^2 of copper. It is provided with two strings at its base. The base is round shaped with 3 mm ball which prevent perforation through cervix. This IUD is composed of polyethylene impregnated with barium sulfate. It is available in a sterilized sealed packet along with a **plunger (solid white rod)** and a preloaded inserter tube. **It is recommended to use for 10 years (Fig. 10.9).**

Cu-T 380A stands for arms which signifies that there is additional copper in the arm other than vertical arm.

Cu-T 200 stands for copper is present only in vertical arm with a surface area of 200 mm^2.

Multiload Copper 375: It is a cupper releasing device made up of polypropylene wrapped with copper wire of 375 mm^2 total surface area and 350 mg weight around vertical limb **(Fig. 10.10)**. The arms are flexible plastic serrated fins which keep the device in uterine cavity without stretching. The presence of copper makes the device radiopaque and the arms are radio-translucent (in contrast to Cu-T 380A which is barium sulfate impregnated). The device is provided with preloaded inserter tube and **without any plunger (solid white rod).** Arms remain outside the inserter tube. The standard size is 36 mm in length. The base is not round. It has longer string which is useful for postpartum insertion. Insertion technique is easier than Cu T 380A. **It is recommended for 5 years.**

Copper T380A (model name T Cu 380A) and Multiload copper 375 (model name Cu 375) are supplied by Government of India, free of cost.

Remember that Cu375 is multiload not T-shaped and hence not called copper T.

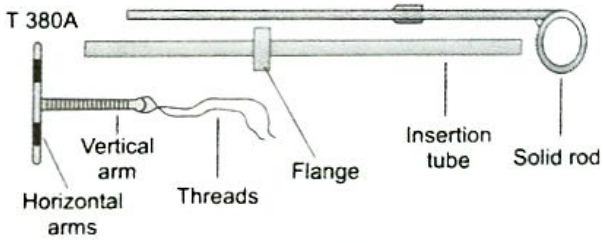


Fig. 10.11: Parts of IUD set.

Parts of IUD set: Insertion Tube, Flange or Guard, Solid rod or Plunger and Copper-IUD Mechanism of insertion of IUD (Fig. 10.11):

- CuT in inserter tube and horizontal arms bent to introduce into inserter tube
- CuT with inserter tube and plunger is introduced into uterine cavity. Before that length of uterine cavity is measured by uterine sound and guard is adjusted to make the length of the system according to cavity length.
- Inserter tube is withdrawal fixing the plunger by other hand that the CuT is released.
- Inserter tube with plunger is brought out to leave the CuT in place.
- CuT is in place; the thread is trimmed to keep the length outside external os 2–3 cm.

C. **Third generation IUD (hormone releasing): LNG-IUS (Mirena): Levonorgestrel intrauterine system (Mirena):** Mirena is a hormonal intrauterine device classified as a long-acting reversible contraceptive method. Mirena consists of a T-shaped polyethylene frame (T-body) with a steroid reservoir (hormone elastomer core) around the vertical stem. The reservoir consists of a white or almost white cylinder, made of a mixture of levonorgestrel and silicone (polydimethylsiloxane), containing a total of 52 mg levonorgestrel. The reservoir is covered by a semiopaque silicone (polydimethylsiloxane) membrane. The T-body is 32 mm in both the horizontal and vertical directions. The polyethylene of the T-body is compounded with barium sulfate, which makes it radiopaque. A monofilament brown polyethylene removal thread is attached to a loop at the end of the vertical stem of the T-body. The polyethylene of the removal thread contains iron oxide as a colorant. LNG is released at a rate of approximately 20 µg/day. This rate decreases progressively to half that value after 5 years. **Mirena is indicated for intrauterine contraception for up to 5 years.**

Failure rate is 0.2/HWY.

Noncontraceptive uses of LNG-IUS are dysfunctional uterine bleeding (DUB), endometriosis, adenomyosis, simple endometrial hyperplasia, etc.

Mechanism of action of IUDs:

- Gametotoxic, both for sperm and egg thus prevent fertilization due to local inflammation by Cu containing device leading to lysosomal activation and other inflammatory action

- Toxic to blastocyst
- Endometrial hostility leading to failure of implantation
- LNG-IUS prevents pregnancy by progesterone mediated mechanism-makes cervical mucus hostile thus preventing sperm penetration, decrease tubal motility thus preventing fertilization, makes the endometrium atrophy, and makes anovulation which is however not consistent.

2024 An ideal candidate for use of IUD as a contraceptive device *(SSUHSA, 2017; SMU, 2014; RGUHS, 2008; TDMGRMU, 2008; BUMP, 2016; VNSGUS, 2023)*

Ans: The candidate should possess the criteria following criteria:
- Who has borne at least one child
- Mother has no history of pelvic disease
- Mother has normal menstrual period
- She is willing to check the IUD tail
- She has access to follow-up and treatment of potential problems
- She is in a monogamous relationship

Time of insertion: Ideal time for insertion of IUD- As per WHO guidelines:
- **Any time of the month:** If she is starting within 12 days after the start of her monthly bleeding, no need for a backup method. If it is more than 12 days after the start of her monthly bleeding, she can have the IUD inserted any time if it is reasonably certain she is not pregnant. No need for a backup method.
- **Soon after childbirth:** Any time within 48 hours after giving birth, including by caesarean delivery. If it is more than 48 hours after giving birth, delay until 4 weeks or more after giving birth.
- **After miscarriage or abortion:** Immediately, if the IUD is inserted within 12 days after first- or second-trimester abortion or miscarriage and if no infection is present. No need for a backup method. If it is more than 12 days after first- or second trimester miscarriage or abortion and no infection is present, she can have the IUD inserted any time if it is reasonably certain she is not pregnant. No need for a backup method. If infection is present, treat or refer, and help the client choose another method. If she still wants the IUD, it can be inserted after the infection has completely cleared. IUD insertion after second-trimester abortion or miscarriage requires specific training. If not specifically trained, delay insertion until at least 4 weeks after miscarriage or abortion.

Selection of patient: Selection can be done by history taking and examination including pelvic (P/V) examination to exclude any contraindication. Women is explained the procedure and informed about the problems those may arise associated with it, follow up protocol, to report in case of any problem and **written consent is taken.**

Follow up:
- Patient is counseled that initially, there may be pelvic cramp and increase vaginal bleeding.
- Patient is usually asked to come for follow up after the next period of 3–6 weeks after insertion. In the first visit, she is asked for any side effects and presence of IUD is confirmed by presence of string.
- Women is asked to feel the thread after next period and time to time for first few months and then annually.
- If any excessive symptoms or amenorrhea she is advised to come.
- If she misses a period, she consults the doctor.
- She should also be advised after how many years she will come for changing the device or for alternate contraceptive or for further use.

Advantages of IUD as a contraceptive	Disadvantages of IUD as a contraceptive
One time motivation	A health worker or medical personnel is essential for screening and introduction
Good efficacy, failure rate low- Cu IUD 0.6/HWY, LNG IUS failure rate 0.2/HWY	They have some complications like pain, bleeding, pelvic infection and perforation
Safe and less complication	Insertion is painful

Contd...

Contd...

Advantages of IUD as a contraceptive	Disadvantages of IUD as a contraceptive
Long-acting reversible contraception (LARC)	Expulsion occurs spontaneously without knowledge
No further costs after insertion	Does not prevent STDs including AIDS/HIV infection
Does not require any thing to do after insertion by the user	
Not interference in sex	
No systemic side effect and life risk is minimum	
No effect on breastfeeding	
Health benefits—protects against risk of pregnancy and protect against endometrial cancer	
Reversible action—after withdrawn she can conceive immediately	
Effective as postcoital contraceptive	
Fit in nulliparous women also	

Q49b. Contraindications of IUDs: *(BNMUB, 2022; RUJH, 2023)*

Ans:

Absolute	Relative
Suspected pregnancy	Anemia
Presence of puerperal or immediate postabortal sepsis	Acute deep vein thrombosis/pulmonary embolism
Vaginal bleeding	Menorrhagia
Cancer cervix and endometrial cancer	Migraine with aura at any age
Uterine fibroid with distortion of cavity	Ovarian cancer
PID	Increase risk of STI
Pelvic tuberculosis	Unmotivated person
Current purulent cervicitis or Chlamydial infection or gonorrhea	

Q49c. Complications of IUCD:

Ans:

Immediate	Late
Cramping uterine pain-lasts for few hours and if not relieved by analgesic or antispasmodic is given	Menorrhagia (5–10%) and anemia- NSAIDs like Ibuprofen, Diclofenac for first few days of period reduces heavy bleeding. Few women may need iron tablets for anemia
Vasovagal attack rarely occurs immediately after insertion	Dysmenorrhea (5%)
	Expulsion up to 5%
	Perforation: Incidence is 0.1%
	Infection
	PID is 2–5%
	Ectopic pregnancy rate per 1,000 women year in Levonorgestrel IUD and Cu-T 380A users are 0.2 as compared to noncontraceptive users about 3–4.5.

Q50. Emergency contraception/Back up contraceptive. *(WBUHS, 2018; BNMUB, 2014, 2022; ABKUB, 2011; VKSUAB, 2018; RGUHS, 2012; DU, 2013, 2014; SMU, 2011, 2013; NU, 2016; RUJH, 2017; KIMS, 2019; TRIU, 2020; MGUB, 2024)*

Ans: **Emergency contraception** is often called morning after contraception. Any woman can adopt this method to prevent unplanned pregnancy as an emergency. This method is not adopted regularly and should not be taken by couples.

Circumstances for emergency contraceptive adoption:

- Unprotected intercourse
- Rape
- Contraceptive method failure like rupture of condom
- Premature ejaculation (coitus interruptus)

The drugs used in emergency contraception (Fig. 10.12): In India, **Levonorgestrel 0.75 mg** tablet is approved for emergency contraception. It is used as one tablet 0.75 mg within 72 hours of unprotected sex and the 2nd tablet after 12 hours of 1st dose or two oral contraceptive pills containing **50 µg of ethinylestradiol** within 72 hours after intercourse, and same dose after 12 hours or **Mifepristone 10 mg** once within 72 hours.

Fig. 10.12: Emergency contraceptive pills

Terminal methods: Male and female sterilization:

Advantages of tubectomy	*Disadvantages of tubectomy*
Simple, safe, very effective, permanent, life-long method	Usually painful for few days
Nothing to remember, no interference with sex	Chance of postoperative infection or bleeding
No effect on breast milk	Compared to vasectomy, it is slightly more risky
No long-term side effects	
It helps to protect against ovarian cancer	
Simple, save, highly effective, life-long method	Postoperative complication like pain in scrotum, swelling, bruising, bleeding or infection of the wound, fainting, etc.
Nothing to remember except to use condom till he becomes aspermic up to 30 ejaculations	Effective only after patient becomes aspermic
Prolonged sexual pleasure	Sperm granules formation 10–14 days after hospitalization
Vasectomy is easy and safe to perform than tubectomy	Spontaneous recanalization
Surgery can be done even in clinic	Autoimmune response caused by blocking of vas subsequent reabsorption and development of antibodies against sperm in the blood
It does not require hospitalization	

Q51. Describe no scalpel vasectomy (NSV). (RGUHS, 2002, 2015, [illegible])

Ans: No scalpel vasectomy **(NSV)** is a new technique of male sterilization, wherein only one [illegible] made instead of incision. Through the puncture wound, vas is taken out from both the [illegible] after tying two sides of resection. At the end, wound is not sutured, just bandage is sufficient [illegible] dressing. Surgical hook is used instead of scalpel to reach the vases.

Advantages:

- It is safe, convenient and effective.
- Duration is short, less painful and bruising, less invasive and shorter recovery time.
- It is accepted by male.

Q52. Postoperative advice following vasectomy. ([illegible])

Ans: Postoperative advice following a vasectomy is as follows:

- The patient should be told that he is not sterile immediately after the operation. At least [illegible] may be necessary before the seminal examination is negative
- To use contraceptives until aspermia has been established
- To avoid taking bath for at least 24 hours after operation
- To wear a T-bandage or scrotal support ***(Langot)*** for 15 days, to keep the site clean and dry
- To avoid cycling or lifting heavy weights for 15 days, no need for complete bed rest
- To have stitches removed on the 5th day after the operation if it was given

Q53. Miscellaneous contraceptive methods.

Ans:

- Abstinence
- Coitus interruptus
- Safe methods (rhythm method)
- Natural family planning methods
- Breastfeeding/Lactational amenorrhea
- Birth control vaccine

Safe methods (rhythm method): This is known as the **"Calendar method"** 1st described by [illegible] The method is based on the fact that ovulation occurs from 12 to 16 days before the onset of menstruation. The days on which conception is likely to occur are calculated as follows:

The shortest cycle minus 18 days gives the 1st day of the fertile period. The longest cycle minus 10 days gives the last of the fertile period. **For example,** if a women's menstrual cycle varies from 26 to 31 days, the fertile period during which she should not have intercourse would be from the 8th day to 21st day of menstrual cycle, counting day one as the 1st day of the menstrual period **(Fig. 10.13).** However, where such calculations are not possible, the couple can be advised to avoid intercourse from the 8th to 22nd day of menstrual cycle, counting from the 1st day of the menstrual period.

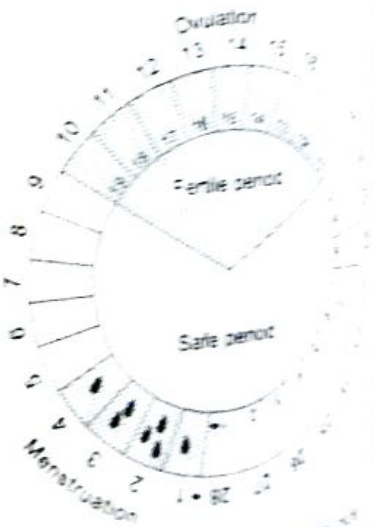


Fig. 10.13: Safe period in a 28-day [illegible]

The drawbacks of safe method are:

- If a woman's menstrual cycles are irregular, it is difficult to predict a safe period
- This method is useful for educated and responsible couples with degree of motivation and cooperation
- Compulsory abstinence of sexual intercourse for nearly one half of every month—what may called, "programmed sex".

- This method not applicable for postnatal period
- A high failure rate of 9 per 100 woman-years

Q34. Cafeteria approach in family planning/ Better approach in family planning *(WBUHS, 2023; ABKUB, 2015; VNSGUS, 2023)*

Ans: Cafeteria approach: The present approach in family planning program is to provide a **"Cafeteria choice"** that is to offer all methods from which an individual can choose according to his/her needs and wishes and to promote family planning as a way of life.

In a cafeteria, a customer has been offered a menu list to choose the item of customer's interest and that particular item or items are offered to the customer. The customer is satisfied in such a way. In family planning issue, the methods are multiple in numbers and the couple is offered all of those methods from which the couple will choose one of them. This is really a cafeteria approach to satisfy a couple in respect of family planning methods.

Q35. A women aged 35 years with two children (age of the last child 5 years) likes to adopt a family planning method. What would be your advice? Give reasons behind your advice. *(BNMUB, 2003)*

Ans: Family planning method for the couple (lady): There is no concept of ideal contraceptives. But **contraceptive should be safe, effective, acceptable, inexpensive, reversible, simple to administer, independent to coitus, long lasting and require little or no medical supervision.**

Again, a method which is quite suitable for one group but may be unsuitable for another group because of different cultural patterns, religious beliefs and socioeconomic condition.

Thus, the present approach in family planning program is to provide a "Cafeteria choice" that is to offer all methods from which an individual can choose according to his/her needs and wishes and to promote family planning as a way of life.

Considering the facts, for counseling the clients on contraceptive use **GATHER** method is practiced.

G—**Greet** the clients
A—**Ask** the client/s about themselves
T—**Tell** clients about FP methods
H—**Help** clients choose a method
E—**Explain** how to use a method
R—**Return** for follow up

Greet the clients:

- As soon as you meet the clients, give them your full attention.
- Be polite, greet them, introduce yourself and offer them seats.
- Ask how you can help.

Ask the client/s about them: Ask clients about their needs, wants, any doubts, concerns, questions they have about family planning. If the client is new, obtain the history.

- Age
- Marital status
- Number of pregnancies
- Number of births
- Number of living children
- FP methods use presently and past
- Basic medical information

Tell clients about FP methods:

- Tell your clients which methods are available and where it is available
- Ask your clients which methods interest them
- Ask your clients what they know about the methods that interest them, if the information is wrong, gently correct the mistake

Briefly describe each method:

- How it works
- Advantages and benefits
- Disadvantages and side effects

Help clients choose a method:

- To help clients choose, ask them about their plan and family situation. What is the family situation now?
- Ask clients what her/his sexual partner wants and what methods would he or she like to use.
- Some methods are not safe for some clients. When method is not safe, tell the client and explain clearly. Then help the client choose another method.
- What method have you decided to use?

Explain how to use a method:

- After the client has chosen the method, give him or her supplies, if appropriate
- If cannot be given immediately, tell how, when and where it will be provided
- For permanent method clients have to sign a consent form. Printed material about the method is allowed to take home

Return for follow up:

At the follow up visit:

- If he or she still is using the method
- If any problem after using the method
- If any side effect (minor or severe) has been observed, let her/him describe
- Ask how the client is using the method
- If the client has any questions, allow her/him to ask

Q55b. 35 years woman with two children (age of the last child 5 years).

Ans: Family planning methods for 35 years women: Spacing methods are not required and suitable. Terminal method like tubectomy or vasectomy by her sex partner is suitable method of contraception. NRR is a demographic indicator. NRR of 1 is equivalent to attaining approximately the 2-child norm. She may choose other method(s) from cafeteria choice of contraceptives.

Q55c. A 25-year-old mother with 2 children aged 5 years and 1 year has come to OPD for family planning advice. Discuss different methods of contraception that can be offered to her with merits and demerits. *(WBUHS 2008)*

Ans: As the woman is 25-year-old, suitable contraceptives in this phase are IUD, Condom and Oral Contraceptive Pill (OCP). If the mother is motivated enough, she can adopt a permanent method (tubectomy) or husband may be motivated for NSV (No Scalpel Vasectomy). The couple should be counseled about the merits and demerits of IUD, Condom, OCP, tubectomy and vasectomy. They will choose the methods through cafeteria choice.

Q55d. A women aged 26 years, having 2 living children (age of last child is 2 years) with no history of multiple partners wants family planning advice from you. What will be your approach for counseling? Give reasons behind different options of family planning methods can be applicable in this case.

Ans: As the woman is 26-years-old, suitable contraceptives in this phase are IUD, Condom and Oral Contraceptive Pill (OCP). If the mother is motivated enough, she can adopt a permanent method (tubectomy) or husband may be motivated for NSV (No Scalpel Vasectomy). The couple should be counseled about the merits and demerits of IUD, Condom, OCP, tubectomy and vasectomy. They will choose the methods through cafeteria choice.

Q55e. What would be the best for a lady aged 36 years with one child of 7 years old. *(TRIU, 2013)*

Ans: As the woman is 36 years old and having one 7 years old child suitable contraceptives in this phase are IUD, Condom and Oral Contraceptive Pill (OCP). As her family is not completed, she can discontinue the above mentioned contraceptives, if they want or can try for another child any time. They should be motivated to adopt permanent methods of contraception (tubectomy) for her after the second child or husband may be motivated for NSV (No Scalpel Vasectomy).

IUD, Condom and Oral Contraceptive Pill (OCP) will be offered to this mother as a **cafeteria choice**. Mother can choose any of these methods. In this case, compliance will be more. She will enjoy satisfaction. Withdrawal will be near zero. The medical history of mother will be taken by health care provider to assess any contraindication of any particular method. In that case choice of mother may be modified convincing the mother for her health and social benefit.

Q55f. A lactating woman likes to adopt a family planning method. What will be your choice? Give reasons behind your choice. *(BNMUB, 2002)*

Ans: A method which is quite suitable for one group, may be unsuitable for another group because of different cultural patterns, religious beliefs and socioeconomic condition. Thus, the present approach in family planning programs is to provide a "**Cafeteria choice**" that is to offer all methods from which an individual can choose according to his/her needs and wishes and to promote family planning as a way of life.

Suitable contraceptive for a lactating woman: OCP cannot be used in first 6 months for lactating mother. Effect on lactation, estrogen content affects quantity and constituents of breast milk, here determines suitable contraceptives of choice. So, condom and intrauterine device (IUD) can be used in this phase. Permanent method is partially contraindicated here as family is not yet completed.

Q55g. A 28-year-old mother with children aged 4 year, and 1 year, has come to you for family planning advice. Describe different methods of contraception that can be offered to her with merits and demerits. *(WBUHS, 2018)*

Ans: As the woman is 28-years-old, suitable contraceptives in this phase are IUD, Condom and Oral Contraceptive Pill (OCP). If the mother is motivated enough, she can adopt permanent method (tubectomy) or husband may be motivated for NSV (No Scalpel Vasectomy). The couple should be counseled about the merits and demerits of IUD, Condom, OCP, tubectomy and vasectomy. They will choose the methods through cafeteria choice.

Q55h. A 25-year-old mother with only one child aged 2 years has come to the OPD for family planning advice. Discuss the different methods of contraception that can be offered to her with merits and demerits. *(WBUHS, 2017)*

Ans: As the woman is 25-years-old and having one 2 years old child suitable contraceptives in this phase are IUD, Condom and Oral Contraceptive Pill (OCP). As her family is not completed, spacing could be the important strategy for them, if they want or can try for another child any time. They should be motivated to adopt permanent methods of contraception (tubectomy) for her after the second child or husband may be motivated for NSV (No Scalpel Vasectomy).

IUD, Condom and Oral Contraceptive Pill (OCP) will be offered to this mother as a cafeteria choice. Mother can choose any of these methods. In this case, compliance will be more. She will enjoy satisfaction. Withdrawal will be near zero. Medical history of mother will be taken by health care provider to assess any contraindication of any particular method. In that case choice of mother may be modified convincing the mother for her health and social benefit.

Q55. **A 26-year-old woman having a 7 month, old baby reported to PHC for contraception. Name the contraceptives methods she can avail. What are the merits and demerits of these contraceptives? According to you, which methods is most suitable for her? Give reasons.** *(SSUHSA, 2018)*

Ans: OCP cannot be used in first 6 months for lactating mother. Effect on lactation, estrogen content affects quantity and constituents of breast milk, here determines suitable contraceptives of choice. As the child is **7-month-old in this case OCP could be used**, condom and intrauterine device (IUD) can be used in this phase. Permanent method is partially contraindicated here as family is not yet completed.

Q56. **Write in brief the advantages and disadvantages of contraceptive methods which an eligible couple should adopt in different phases of their reproductive life to achieve "small family norm".** *(WBUHS, 2009; DU, 2013; SMU, 2012; PUJH, 2019)*

Ans: Contraceptive methods in different phases of reproductive cycle and their advantages and disadvantages:

A. **Phase between marriage and planning for first child:** As the woman is nulliparous, IUD cannot be used in this phase. Suitable contraceptive in this phase are Condom and OCP. Their advantages and disadvantages already discussed in previous question.

B. **Phase between birth of first child and planning for 2nd child:** Condom and IUD can be used in this phase. After the birth of first child, OCP cannot be used in first 6 months, after that it can be used. Advantages and disadvantages of IUD already discussed in the previous question.

C. **Phase of reproductive cycle after the delivery of 2 or more babies:** In this phase, spacing methods are not suitable, limiting methods like vasectomy (No scalpel vasectomy) or tubectomy (minilaparotomy or laparoscopic tubectomy) are suitable contraceptives. Their advantages and disadvantages are discussed in the previous questions.

Q57a. **Couple protection rate (CPR) is persistently low in a block for last few years. Discuss the measures you will adopt to improve the situation as a BMOH of that block.** *(BNMUB, 2013; PBDSUHSH, 2017)*

Q57b. **In a block 40% of eligible couples are protected by modern contraceptive methods. As a BMOH, outline the intervention to improve the situation.** *(WBUHS, 2019)*

Q57c. **In a Block of Nadia district, the couple protection rate is much less in comparison to neighboring blocks. What are the social causes of poor couple protection rate and what measures you will take up as BMOH to improve the situation?** *(WBUHS, 2014, 2019; TRIU, 2019)*

Q57d. **Increase cases with request of removal of Cu-T among postpartum mothers are found in a block primary health center. Being a BMOH, how will you manage the situation?** *(WBUHS, 2020)*

Ans: **BMOH should undertake the following actions** and steps can be taken as follows:

A. **Situation analysis:**

- *Measuring the magnitude of the problem:* From house-to-house survey or subcenter records.
- *Identification of the causes:*
  - Inadequate access to services
  - Fear of side effects
  - Decreased male participation
  - Inhibition from family member
  - Lack of awareness campaign by ANM, ASHA, AWW
  - Illiteracy, ignorance
  - Preference for male child
  - Poor socioeconomic status
  - Decreased number of trained manpower
  - Cultural factors

B. **Setting of objectives:** To increase CPR to 65% within 1 year.

C. **Assessment of resources:**
- *Manpower:* MOs, BPHN, PHN, GNM, health supervisor, ANM, ASHA, etc.
- *Material:* OCP, IUD, condom, injectable contraceptive, health education material
- *Money:* BMOH should apply to the higher authority for sanction of fund

D. **Fixing priorities:** After problems identified by situation analysis, resource assessment and establishment of objectives, priority action should be chosen. Because problems are many but resource is scarce. From different problems one or two problems will be taken for action implementation.

E. **Plan formulation:** Preparation of detailed plan(s) should be done in all respects for the execution of a project for all kinds of activities to increase CPR within the time frame. Expected outcome objectives should be considered during planning. It might include counseling of target couples male partners specialty and other family members to adopt suitable family planning methods care through cafeteria choice. Each activity will be monitored and ultimately evaluation should be a part of this plan.

F. **Implementation:**
- *Expansion of contraceptive method and using cafeteria approach:* There should be expansion of the choices from Current five (Condom, OCP, IUD, vasectomy, tubectomy) to the newer methods like injectable contraceptive, centchroman, etc. Under cafeteria approach, clients are adequately explained about advantages and disadvantages of different methods and clients can freely choose the most convenient method.
- *Provision of surgical facilities in each CHC:* For this purpose, at least one medical officer of the CHC should be adequately trained in one surgical method.
- Providing facilities of IUD insertion at subcenter level by ANM and follow up visit for any complication.
- Provision of condom and OCP at village level by AWC and ASHA.
- Collaboration with private sectors in providing family planning services.
- Training of different categories of staffs to improve the quality and coverage of services.
- One couple from each village will be selected by the villagers themselves and will be trained to provide counseling services.
- It can be given through mass media, interpersonal communication or group approach. Doctor, Nurse, BPHN, PHN, ANM, AWW can perform as health educators.
- *Behavior change communication (BCC):* It helps to change established mode of behavior.
- Community participation by involving ASHA, AWW, CHG, Self-help group, NGO, etc.
- Regular meeting with different categories of staffs to assess what sorts of help is further necessary for implementation of different strategies.

G. **Monitoring:** During program implementation, careful watchfulness is required to see whether activities are going on in expected time in correct way. This continuous observation is essential to see the track of activities and to identify flaws in order to take corrective measures.

H. **Evaluation:** Evaluation is done at the end of all activities. This is done to assess the achievement to increase CPR at the end of at least 1 year. Other things are also considered. These are efficiency of the workers, adequacy of the activities, and acceptability of the program by general population.

I. **Conclusion:** This last step will tell us whether the activities have achieved our objectives. If CPR increased by these activities, the program will be continued. If it did not work in the expected level, objectives will be reformulated and accordingly plan will be revisited and implemented. In this way, we will be able to take action to increase CPR in that particular block area.

SHORT NOTES AND RELEVANT QUESTIONS

Q83. **Scope of family planning services.** *(MUHS, 2019)*

Ans: The scope of family planning services are as follows:
- Spacing and limitation of births
- Premarital and genetic counseling

- Education for parenthood and sex education
- Advice on sterility
- Screening for pathological conditions related to reproductive system (e.g., cervical cancer)
- Pregnancy tests and services for unmarried mothers including abortion services
- Birth preparedness for 1st pregnancy regarding finance, transport, place of deliver, who will accompany mother in the health facility and blood group of mother
- Advice on nutrition, rest and use of drugs

Q59. What are the health benefits of family planning? *(BNMUB, 2001, 2012)*

Ans: The family planning and health have a two-way relationship. The health benefit of family planning methods are summarized in the following headings:

- **Women's health benefit:** Risk of dying as a result of pregnancy is much greater in India than in any other developing countries. The risk increases as the mother grows older and after she has had 3 or 4 children. The health impact of family planning occurs primarily through i) avoidance of unwanted pregnancies, ii) Limiting the number of births and proper spacing and iii) timing the birth particularly the first and last. Benefits are available in such a way in family planning as mentioned above.
- **Fetal health:** A number of congenital anomalies (e.g., Down's syndrome) are with advanced maternal age. Such condition can be avoided by timing the birth in relation to mother's age. The quality of population can be improved only by avoiding unwanted births.
- **Child health:** Child mortality increased when pregnancies occur in rapid progression. A birth interval of 2 to 3 years is considered desirable to reduce child mortality.
- **Child growth, development and nutrition:** Birth spacing and family size are important factors in child growth and development. Family planning is effective prevention against malnutrition.
- **Infectious diseases:** Children living in a large sized family have been seen with increased infection especially gastroenteritis, respiratory and skin infections.

Q60. Traditional Birth Attendants (TBA). *(BNMUB, 2002)*

Ans: Most deliveries in the rural areas are still handled by untrained dais who are often the only people immediately available to woman during perinatal period. An extensive program has been undertaken, under the rural health scheme, to train all categories of local dais (traditional birth attendants) in the country to improve their knowledge in the elementary concept of maternal and child health and sterilization besides obstetrics skills and to make them trained birth attendant. The training is for 30 working days. Each dai is paid a stipend of ₹ 300 during her training period. Training is given at PHC, subcenter or MCH center for 2 days in a week and remaining 4 days of the week, they accompany the health worker to the villages preferably in dais' own area. During her training, each dai is required to conduct at least 2 deliveries under the guidance and supervision of the HW (F), HA (F), ANM. The emphasis during training is on asepsis, so that home deliveries are conducted under safe hygienic condition, thereby reducing the maternal and infant mortality. After successful training each dai is provided with a delivery kit and a certificate. These dais are also expected to play a vital role in propagating small family norm, since they are more acceptable to the community. Thus, TBA becomes TTBA (Trained Traditional Birth Attendants) for safe and assured delivery.

Q61. Unmet need for family planning. *(WBUHS, 2011; BNMUB, 2008, 2010; SSUHSA, 2016; AKUB, 2023; SDVPG, 2023)*

Ans: Many women who are sexually active would prefer to avoid becoming pregnant, but nevertheless not using any method of contraception. **These women are considered to have an unmet need for family planning.** The concept usually applied to married women, but it can be applied to sexually active women, but its measurement has been limited to married woman only. Unmet need can be a powerful aspect of family planning. It poses a challenge to family planning— to reach and serve millions of women whose reproductive

attitude resembles those of contraceptive users—but who are for some reason or combination of reasons not using contraceptives.

Causes and factors:

- Inconvenient timing of services, poor quality of services, unsatisfactory behavior of the staff, etc. Lack of awareness and information about family planning services.
- Fear of contraceptive side effects like pain, bleeding following IUD insertion.
- **Misc factors:** Age, Residence, Education, Religion, caste, Socioeconomic status, opposition from husband or mother- in-law which is very relevant problem in our country.
- **Current situation:** Unmet need for spacing is 6.2% and limiting is 6.6%, total is 12.8%.

How to solve? Availability of newer methods: Under RCH, emphasis should be given on various newer methods like injectable contraceptives, centchroman, lactational amenorrhea, etc., besides IUD, OCP, condom, vasectomy, tubectomy through **GATHER approach.**

Eligible couple. *(WBUHS, 2021; ABKUB, 2022; SAMU, 2009, 2015; TDMGRMU, 2011, 2013; RUJH, 2023; GOAU, 2023; VNSGUS, 2023; SDVPG, 2023)*

Ans: Eligible couple is a currently married couple where the wife is within the reproductive age group (15–45 years) and where the partners have not adopted terminal methods of family planning, i.e., none of them is sterilized. On an average, there are about 150–180 such couples per 1,000 population in India and about 20% of them fall in the age group of 20–24 years.

Significance: In each subcenter, eligible couple registers are maintained and regularly updated by female health worker. During family planning activities, these couples are approached by health workers during their home visits as well as when these couples attend health facility in subcenter areas and its higher facilities.

Target couples. *(RGUHS, 2010; TDMGRMU, 2011; RUJH, 2023; SDVPG, 2023)*

Ans: Target couples:

- Target couples are the eligible couples with two or three living children.
- They constitute priority groups within the definition of eligible couples in any family planning program.
- Such couples are advised to undergo tubectomy or vasectomy.

Significance: Concept of target couple is lost its original meaning and is outdated since inclusion of families with one child and even newly married couples under its ambit to create awareness about family planning from earliest possible stage.

Define contraceptive prevalence rate. *(BUMP, 2012)*

Ans: Contraceptive prevalence rate: It is estimated that during 2015–2016, about 53.5% of eligible couples in the reproductive age groups 15–44 year were effectively protected against conception by one or the other family planning method.

The view of demographers are that the demographic goal of NNR = 1 can be achieved only if CPR is more than 60%.

Net reproductive rate (NNR) of 1 is equivalent to attaining approximately the two-child norm.

Pearl index. *(ABKUB, 2019; BNMUB, 2020, 2022; RGUHS, 2002; YSRUHSAP, 2021; PBDSUHSH, 2015; TDMGRMU, 2013, 2014; MU, 2022; RUJH, 2009, 2024; SDVPG, 2023)*/**In designating effectiveness of any family planning methods, "Pearls index" plays a very critical role.** *(AKUB, 2022)*

Ans: Pearl index is defined as the number of failures per 100 women years of exposure (HWY).

$$\textbf{Pearl Index} = \frac{\text{Total No. of accidental pregnancies}}{\text{Total months of exposure}} \times 1200$$

Total number of accidental pregnancies must include every known conception, whatever outcome, whether live birth, stillbirths or abortions or not yet terminated

- The factor 1,200 indicates the number of months in 100 years
- The total woman months of exposure in the denominator are obtained by deducting 10 months for full term pregnancy or 4 months for abortion from the period under review
- For the purpose of Pearl index, a minimum of 600 months of exposure is usually considered necessary before any firm conclusion can be reached.

Interpretation: Two methods have been used to measure the contraceptive efficacy are Pearl index and Life-table analysis.

Q66. Outline the steps for evaluation of family planning program. *(WBUHS, 2015)*

Ans: Five types of evaluation have been defined by WHO expert Committee in 1975 on evaluation of family planning program.

1. **Evaluation of need:** Health, demographic and socioeconomic needs for family planning. For example, the current status of maternal mortality in a given area is an indicator of the need for family planning.
2. **Evaluation of plans:** An assessment of the feasibility and adequacy of program plans is required.
3. **Evaluation of performance:**
   - *Services:* Clinic services, mobile services, postpartum services, contraceptive distribution, follow-up services, education and motivation activities.
   - *Response:* Number of new acceptors, characteristics of acceptors
   - Cost analysis
   - *Other activities:* Administration, manpower and data system, etc.
4. **Evaluation of effects:** Change in knowledge, attitudes, motivation, and behavior
5. **Evaluation of impact:** Proposed following indices for evaluation of impact
   - Family size
   - Desired number of additional children
   - Birth interval
   - Age of the mother at birth of first child and last child
   - Birth order
   - Number of abortions

Q67. Medical Termination of Pregnancy Act (MTP), 1971. *(AKUB, 2022; ABKUB, 2022; BNMUB, 2014; VKSUAB, 2016; RGUHS, 2008, 2013; TRIU, 2014; TDMGRMU, 2012, 2014; DU, 2015; NU, 2015; MU, 2023)*

Ans: Full form of MTP is medical termination of pregnancy.

A. This is a condition under which a pregnancy can be terminated under the MTP act 1971. Following five **conditions** are considered for termination of pregnancy under the act:
   1. *Medical:* Health of the mother in stake (uncontrolled hyperemesis gravidarum) compels here.
   2. *Eugenic:* Rubella affected mother may go for abortion
   3. *Humanitarian:* Rape caused pregnancy
   4. *Socioeconomic:* Unable to bear the cost of child rearing
   5. *Failure of contraceptive devices:* Contraceptive failure is indication of abortion

B. **The person/persons who can perform abortion:** Only Registered Medical Practitioner experienced in Gynecology and Obstetrics within 12 weeks of pregnancy, where pregnancy exceeds 12 weeks but not more than 20 weeks the option of two Registered Medical Practitioner (RMP) is necessary to terminate the pregnancy.

C. **Where abortion can be done:** Hospital establishment, place approved by government.

Amendment of MTP rules in 1975, to eliminate time consuming procedures and make services more readily available.

A. **Approval by board:** CMOH of the district is empowered to certify a doctor has the necessary training in Gynecology and Obstetrics to do abortions.

B. **Qualification required to do abortion:** If the doctor has assisted a RMP in the performance of 25 cases of medical termination of pregnancy in an approved institution. The doctor may also qualify to do MTPs under the new rules if he has one or more of the following qualifications:
- 6 months horsemanship in Gynecology and Obstetrics
- A postgraduate qualification in OBG
- 3 years of practice in OBG for those doctors registered before the 1971 MTP Act was passed.
- 1 year of practice in OBG for those doctors registered on or after the date of commencement of the act.

C. **The place where the abortion is performed:** Under the new rules, non-governmental institutions may also take up abortions provided they obtain a license from CMOH of the district.

A recent amendment of MTP act in the year 2003 includes decentralization of power. The strategy at community level is:
- Spread awareness regarding safe MTP in the community and availability of services
- Enhance access to confidential counseling; training of ANM, AWW, ASHA/link workers
- Promote postabortion care services through ANM, AWW, ASHA/link workers

Q68. PC and PNDT Act. *(WBUHS, 2013, 2023; BNMUB, 2020; DU, 2014; NU, 2016)*

Ans: Pre-Natal Diagnostic Technique (PNDT) Act was passed in 1994 and 2002 this act was later amended in 2014 to include preconceptional provisions and the act has become preconception and PNDT Act. There are 8 chapters and 34 clauses under this act. This act was introduced for regulation of prenatal diagnostic techniques for the purpose of prenatal determination of chromosomal, genetic, metabolic and sex-linked disorder, and prevention of use of techniques for prenatal determination of sex.

Indications: According to this act, **prenatal diagnostic technique is indicated only in:**
- Genetic metabolic defects
- Hemoglobinopathies
- Sex linked disorder
- Congenital anomalies
- Chromosomal anomalies

Conditions to be fulfilled for prenatal diagnostic technique:
- Age of the pregnant woman should be more than 35 years.
- She has undergone two or more spontaneous abortion.
- She has potential exposure to drugs, radiation, chemical.
- She has a family history of mental retardation/spasticity/genetic defect.

There are central and state supervisory boards for the regulation of the act. According to this act, contravention of any provisions of the act or rules is a punishable offence with imprisonment for a term, which may extend to 3 years and with fine, which may extend to ₹ 10,000 and on any subsequent conviction, with imprisonment which may extend to 5 years and with fine, which may extend to ₹ 50,000. The name of the registered medical practitioner who has been convicted by the court can be informed to the respective state medical council for taking necessary action including the removal of his name from the register of the council for a period of 2 years for the first offence and permanently for the subsequent offence.

QM10.5: Describe Universal Immunization Program.

IMMUNIZATION AND VACCINE RELATED ISSUES

Q69. Mission Indradhanush. *(KIMS, 2021; AFUH, 2023; NU, 2017)*

Ans: Absolutely identical to its name Indradhanush—the seven colors of the rainbow, Union Health Minister JP Nadda launched vaccination for seven life-threatening diseases—poliomyelitis, hepatitis B, diphtheria, measles, meningitis, tetanus, tuberculosis, and whooping cough.

It has been reported during 2009 to 2013, the immunization coverage in India increased from 61 to 65%, indicating 1% increase every year. The Mission Indradhanush was launched by Government of India on

December 25, 2014, to speed up immunization rate by more than 5% annually to achieve the target of ... coverage of the children by 2020 against seven vaccine preventable diseases, diphtheria, pertussis, tetanus, poliomyelitis, measles, hepatitis B and childhood tuberculosis, depicting seven colors of the rainbow in Indradhanush. Full immunization will reduce disease mortality and morbidity of lakhs of children and ... and which is essential for social development of the country. The program implemented in phased manner. Focused on that districts where half of the children not immunized. **201 districts** will be covered in the ... phase, out of which **82 districts** are in the state of Bihar, Uttar Pradesh, Rajasthan and Madhya Pradesh. ... **districts** will be targeted in the phase manner. The focus is an urban slums and districts with slower ... and completion of due list of beneficiaries on the basis of head count surveys.

Mission Guidelines:

- Immunization will be speeded up in Catch-up campaign
- Planning and monitoring will be conducted as per the experience gained from IPPI
- The mission will be technically supported by UNICEF, WHO and Rotary International
- Meticulous microplanning ensuring sufficient supply of vaccines, vaccinators and other logistic support
- Ensuring community participation by effective communication and social mobilization
- Accountability

National level: Mission Indradhanush will be reviewed by the office of honorable Prime Minister and Minister of Health and Family Welfare. Coordination with other ministries and key partners will be strengthened for effective program implementation. State officials will be oriented on operational and financial guidelines. The national task force will review and monitor the implementation and progress of Mission Indradhanush. Prototypes of communication materials, including banners, posters, audio and video spots will be prepared and shared with all states.

State task force for immunization, under leadership of Principal Secretary, Health works to guide and monitor progress in districts, to strengthen coordination with other relevant departments and key partners for effective program implementation. Principal Secretary Health and Mission Director, NHM work to sensitize District Magistrates concerned through video conference before first week of February, followed by a video conference to review preparedness for the forthcoming campaign. Subsequently, the quality of each round is reviewed through video conference.

District level: District task force for immunization, under leadership of District Magistrate is formed to guide and monitor progress in blocks/urban bodies, to strengthen coordination with other relevant departments and key partners for effective program implementation.

Block/Urban area level: Block area task force for immunization, under leadership of Block Development Officer is formed to guide and monitor progress in blocks/urban local bodies. Training of frontline health workers, including ANMs, ASHAs and Anganwadi workers and sensitization of PRIs is done. Estimation of beneficiaries in left out areas by ASHAs is an important function. Timely dissemination of funds, Vaccines and communication materials are other activities. Under the plan, States will conduct Intensified Mission Indradhanush drives for seven working days from 7th day of every month starting from 7th October 2017 for four consecutive months excluding Sundays, holidays and Routine Immunization days. A total of 118 districts, 17 urban areas and 52 districts of northeast states have been targeted under Intensified Mission Indradhanush.

Four phases of Mission Indradhanush have been completed in 528 districts across the country. More than 2.47 crore children and around 67 lakh pregnant women have been vaccinated under Mission Indradhanush so far. The first two phases of Mission Indradhanush led to an increase of 6.7% full immunization coverage in 1 year as compared to 1% increase in the past. This increase has been more prominent in rural areas as compared to urban areas.

Zero-Dose Immunization Program (ZIP) was initiated by WHO to enhance immunization coverage in the whole country.

Q70. Explain National Immunization schedule of India. *(WBUHS, 2022, BNMUB, 2015, 2016, VKSUAB, 2020; KIMS, 2021; RGUHS, 2008; TRIU, 2013, 2014; TDMGRMU, 2013, DU, 2014; NU, 2013, SSUHSA, 2018, 2021, 2023; ABKUB, 2023*

National Immunization schedule of India:

Name of vaccine	When to give	Dose	Route	Site
For Pregnant women				
Td-1	Early in pregnancy	0.5 mL	Intramuscular	Upper arm
Td-2	4 weeks after TT/Td-1	0.5 mL	Intramuscular	Upper arm
Td-booster*	If received 2 doses of TT/Td in a pregnancy within last 3 years	0.5 mL	Intramuscular	Upper arm
Infants				
BCG (birth dose)	At birth or as early as possible till 1 year of age	0.05 mL until 1 month of age, after 1 month 0.1 mL	Intradermal	Left upper arm
Hepatitis B (birth dose)	At birth or as early as possible within 24 hours	0.5 mL	Intramuscular	Anterolateral aspect of mid-thigh-left
Oral Polio Vaccine ‡OPV – 0 (birth dose)	At birth or as early as possible within first 15 days	2 drops	Oral	Oral
OPV- 1, 2 and 3	At 6, 10 and 14 weeks (can be given till 5 years of age)	2 drops	Oral	Oral
‖fIPV	At 6, 14 weeks and 9–12 months	0.1 mL	Intradermal	Right upper arm
Pentavalent vaccine 1, 2 and 3	At 6, 10 and 14 weeks (can be given till 1 year of age)	0.5 mL	Intramuscular	Anterolateral aspect of left mid-thigh
****Rotavirus vaccine (RVV) 1, 2 and 3**	At 6, 10 and 14 weeks (can be given till 1 year of age)	2 mL	Oral	Oral
‡‡PCV (pneumococcal conjugate vaccine)	At 6, 14 weeks and booster dose at 9 to 12 months	0.5 mL	Intramuscular	Anterolateral aspect of right mid-thigh
¶Measles-rubella (MR) vaccine 1st dose	9 completed months-12 months	0.5 mL	Subcutaneous	Right upper arm
¶¶Japanese encephalitis (JE) -1st dose)	9 completed months-12 months	0.5 mL	Subcutaneous	Left upper arm
JE vaccine (Inactivated)-1st dose	9 completed months-12 months	0.5 mL	Intramuscular	Anterolateral aspect of mid-thigh
For children				
OPV booster	16–24 months	2 drops	Oral	Oral
Diphtheria, pertussis and tetanus (DPT) Booster -1	16–24 months	0.5 mL	Intramuscular	Anterolateral aspect of left mid-thigh
¶MR vaccine 2nd dose	16–24 months	0.5 mL	Subcutaneous	Right upper arm
¶¶JE vaccine 2nd dose	16–24 months with DPT/OPV booster	0.5 mL	Subcutaneous	Left upper arm
JE vaccine (inactivated)-2nd dose	16–24 months	0.5 mL	Intramuscular	Anterolateral aspect of mid-thigh
Diphtheria, pertussis and tetanus (DPT) Booster-2 Td	5–6 years	0.5	Intramuscular	Upper arm
	10 years and 16 years	0.5	Intramuscular	Upper arm

*One dose if previously vaccinated within 3 years
‡OPV –0 (birth dose): **For sensitization of gut**] up to 15 days
‖fIPV- **3rd dose** at 9–12 months of age from 1st January 2023 under UIP.
RVV: **Lyophilized vaccine in 11 states (Dadra and Nagar Haveli, Daman and Diu, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Maharashtra, Puducherry, Telangana, and West Bengal) and liquid vaccine (2 mL) in remaining 25 states.
‡‡PCV in selected states/districts: Bihar, Himachal Pradesh, Madhya Pradesh, Uttar Pradesh (12 districts) and Rajasthan (9 districts)
¶**Measles-Rubella** vaccine up to 15 years after campaign
¶¶**JE vaccine** is introduced in select endemic district after campaign

Note:

- Minor coughs, colds, mild fever, and diarrhea are not contraindications to vaccination.
- Interval between two doses should not be <1 month.
- If multiple injectable vaccines are required to give at the same site, there should be a gap of at least 1 inch.
- Vaccines can be given on demand at a later age than scheduled, if not given earlier.
- Hepatitis vaccine can be given up to 24 hours
- BCG vaccine can be given up to 1 year.
- Pentavalent vaccine should be given up to 1 year of age. If a child has received at least one dose of pentavalent vaccine before his/her 1st birthday, in that case, subsequent doses could be given at a minimum interval of 4 weeks, at the earliest availability opportunity.
- Rota virus can be given up to 1 year.
- fIPV/IPV can be given maximum up to 1 year.
- PCV should be given under 1 year of age. In delayed cases, due doses above 1 year of age can be given to a child only if a child has received at least PCV before his/her 1st birthday.
- Measles/MR can be given up to 5 years
- OPV up to 5 years
- DPT vaccine can be given up to 7 years of age.
- JE vaccine can be given up to 16 years
- Vitamin A (1st dose) given along with measles vaccine, 1 mL (1 lakh IU) orally. Vitamin A (2nd to 9th dose) given at 16 months thereafter every 6 months interval of a total of 9 doses, up to 5 years, 2 mL (2 lakh) orally in collaboration with ICDS (AWW)

Q70a. Vitamin A prophylaxis schedule (9 months–5 years children):

Ans:

No. of dose	*Age of the child*	*Dose*	*Remarks*
1.	9 months	100,000 IU	Along with measles vaccine
2.	1 ½ years	200,000 IU	With booster doses of DPT and OPV
3.	2 years	200,000 IU	Nil
4.	2 ½ years	200,000 IU	Nil
5.	3 years	200,000 IU	Nil
6.	3 ½ years	200,000 IU	Nil
7.	4 years	200,000 IU	Nil
8.	4 ½ years	200,000 IU	Nil
9.	5 years	200,000 IU	Nil
	Total	1,700,000 IU	

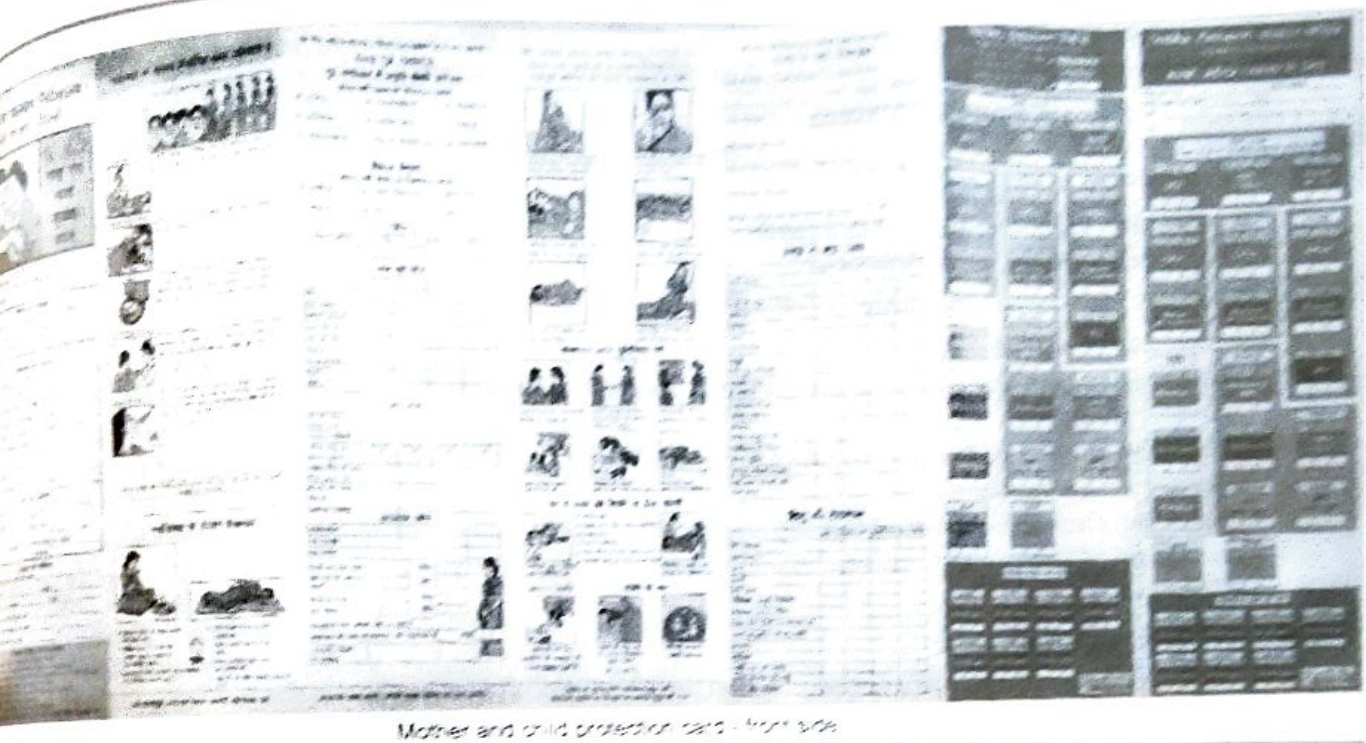
Q71. List different types of live vaccines. *(BNMUB, 2014, 2016)*

Ans: Live attenuated vaccines: Live vaccines are prepared from live or wild (generally attenuated) organisms. These organisms have been passed repeatedly in laboratory in tissue culture or chick embryos and have lost their capacity to induce full-blown disease but retain their immunogenicity and they remain alive. This is a kind of attenuation. Vaccines prepared in such a way is called live attenuated vaccine.

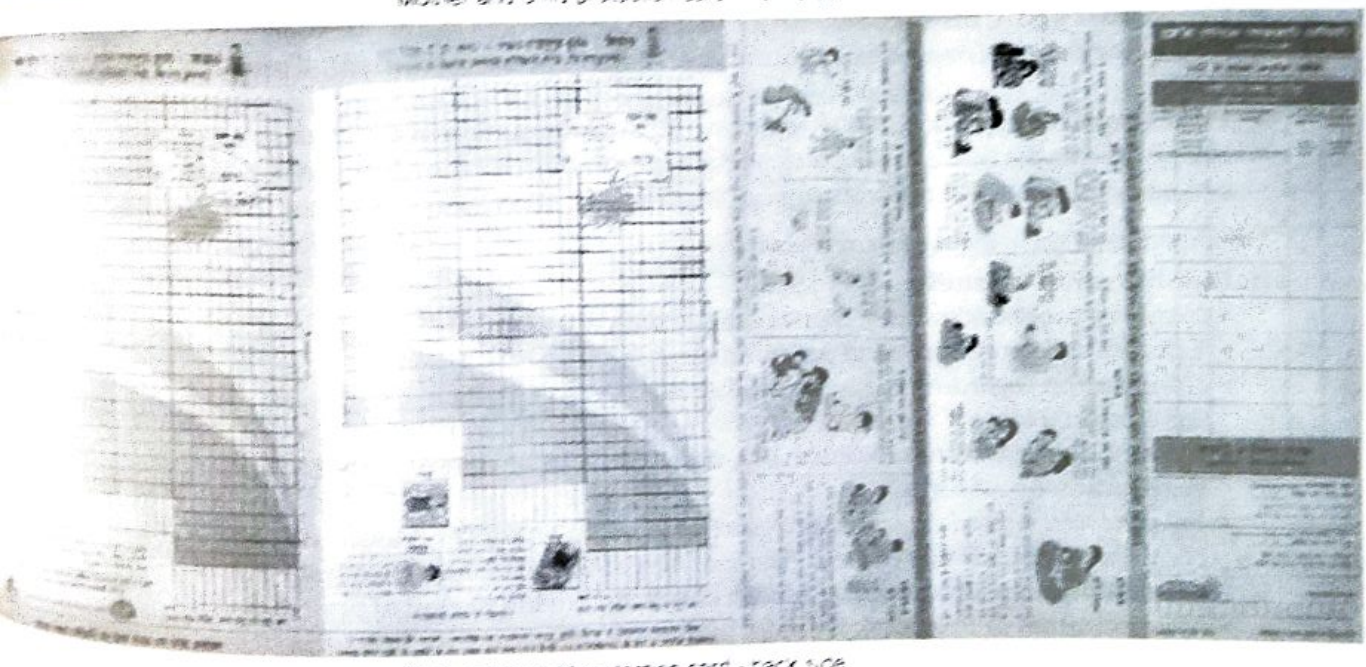
Some of the live attenuated vaccines are mentioned below. BCG, measles vaccine, oral polio vaccine, yellow fever vaccine, rubella, typhoid, varicella and rotavirus are examples of live vaccines.

Q72. Explain mother and child protection card (MCPC)—explain.

Ans: Immunization card is replaced by **"Mother and Child Protection Card (MCPC)"** which is used all over India and translated in regional languages of India. **It is a pictorial card consisting of the following (Fig. 10.14):**



Mother and child protection card - front side



Mother and child protection card - back side

Fig. 10.14: Mother and child protection card (front and back side)

Importance of MCP card:

- The Mother and Child Protection Card has been developed as a tool for families to learn, understand and follow positive practices for achieving good health of pregnant women, young mothers and children.
- Card helps families to know about various types of services which they need to access for the health and well-being of women and children.
- The card empowers families to make decisions for improved health and nutritional status and development of young children on a continual basis.

The user of the card:

- Family members (Mothers, Fathers, Mother-in-laws, Adolescent girls and others)
- Village groups/Women (Mahila Mandal) groups
- ANM/AWW
- Health and ICDS Supervisors

The specific target groups of the card

1. Pregnant women
2. Families with children under 3 years of age

How to use the card:

- Information on the cover page on Family Identification and Birth Record should be filled in before the card is given.
- Families should be advised to bring the card along when they visit AWC, subcenter, health center, private doctor and a hospital.
- Families should be advised to keep the card in a safe place to prevent it from wear and tear. The various sections of the card should be explained using support material before the card is given to the target families.

The card is color coded:

- **Yellow color** has advice/information that the ANM/AWW must explain to the mother and family members. The reasons/details are given below the yellow box.
- **Green boxes** have instructions/advice that the family must follow/ensure.
- **Red color** denotes danger and requires immediate contact with medical provider, danger signs is in red boxes.
- **Pink boxes** require ANM/AWW to record/fill the information in the card.
- Blue boxes and writing in blue is important information for the ANM/AWW, which she must understand before counseling the mothers.

Description of the card are given below:

A. **Identification of family:**

- Name of pregnant mother, name of father with full address and mobile no.
- Educational qualification of pregnant mother
- Information regarding pregnant mother like, LMP, EDD, Para, Gravida, where last delivery conducted: Institution/Home
- Information regarding childbirth like, name of the child, date of birth (DOB), birth weight, male, female, registration no. of birth
- *Information regarding institute:* Name of Health worker (F), Mobile no., Name of ASHA, Mobile no. Name of AWW, Mobile no. and Name of AWC/SC/PHC/Block Hospital/FRU

B. **Information regarding regular health check-up during period of pregnancy:**

- Nine columns in this section depict months of pregnancy with pictures of pregnant women. The first column corresponds with the first month of pregnancy, the second with the second month of pregnancy and other seven column for remaining 7 months of pregnancy.
- Registration
- No. of Health checkup at least 4 (four)
- Measurement of BP in each checkup; Blood examination—hemoglobin, glucose, blood group and Rh factor, VDRL and HIV antibody, urine examination for sugar and albumin
- Measurement of weight (normal weight gain 10–12 kg during pregnancy period)
- Td injection
- Iron folic acid tablets (180 days in ANC and 180 days in PNC periods)
- Advice regarding intake of one extra meal
- Advice for rest, at night 8 hours and 2 hours after lunch

C. **Information regarding previous childbirth:**
   a. APH, b. Eclampsia, c. Anemia, High BP, obstructed labor, PPH, LUCS, congenital anomaly of the baby and others problems (if any)
   b. Any pre-existing disease like TB, high BP, heart disease, diabetes, asthma and other problems (if any)

D. **Danger signal for quick referral:**
- Anemia
- Bleeding (APH, PPH)
- Fever, Prolonged Labor
- Convolution
- Headache
- Blurring of vision
- Nausea
- Swelling of body especially foot
- Watery discharge during labor

Birth preparedness
- *Contact:* Health worker, ASHA, AWW
- Enrolment under JSY
- Selection of hospital for delivery beforehand
- Arrangement of transport beforehand
- Ensure 48 hours stay in hospital after delivery
- Initiation of breastfeeding after delivery as applicable
- Advice regarding birth spacing and FP methods through cafeteria choice

E. **Care of newborn:**
- Keep the child warm
- Weighing of child within first hour of life before significant postnatal weight loss has occurred
- Exclusive breastfeeding (EBF)
- No bath in first 48 hours
- Clean cord stump (no applicant)
- Prevent infection

F. **Danger signal of child:**
- High temperature/cold and calm skin
- Lethargy
- Cannot suck well
- Breathlessness
- Convulsion
- Blood mixed with stool

G. **Immunization schedule in details as per UIP**
H. **Regular weighing of child by using of WHO growth chart for boys and girls**
I. **Information regarding exclusive breastfeeding (EB) up to 6 months and introduction of supplementary feeding for 6 months to 3 years of child and reasons for special care, feeding problems and possible solutions.**
J. **Milestone of development of child.**

In your district the immunization rate has fallen to 50%. How would you investigate to find out the reason. How do you concurrently try to increase the immunization rate? *(WBUHS, 2012)*

The percentage of fully immunized children is very low while left-out and drop-out rates are unacceptably high in your block. What measure will you adopt as a BMOH to improve the situation? *(WBUHS, 2011)*

Q73c. **Immunization dropouts and left outs found to be quite high for consecutive years in a block. Mention the possible reasons and outline the measures that can be adopted by the health administrator in that block to improve the situation.** *(WBUHS, 2016)*

Q73d. **The immunization coverage rate in your block has been observed to be low during the last 3 years along with high dropout rate. What may be the possible reasons for this situation? Outline the steps that should be undertaken as a BMOH to investigate and improve the situation.** *(WBUHS, 2018)*

Q73e. **As a MO I/C of PHC, what measure will you take to improve the low immunization coverage being reported in your PHC.** *(TRIU, 2011)*

Ans: **Procedures of investigation:** BMOH would investigate the situation in the following manner.

A. **Analysis of situation:**
- *Measurement of the magnitude of the problem:* This can be measured by-House to house survey, Records from Anganwadi center and subcenter reports, etc.
- *Identification of probable the causes:* Less supply of vaccines against demand, inadequate distribution of vaccines to the different subcenters, lack of manpower, lack of training of manpower (refresher and job training), timing of the services, less of outreach sessions with repeated cancellation of outdoor session, geographical barrier.
- Lack of information and awareness campaign by AWW, ASHA, rude behavior of the healthcare providers, illiteracy, ignorance, inadequate monitoring and supervision.

B. **Setting objectives:** Increase coverage from 50% to 80% in 1st year, 80% to 90% in 2nd year

C. **Assessment of resources**
- Manpower
- Material
- *Money:* BMOH should apply to the district or state health authority for release of fund

D. **Fixing priorities**

E. **Plan formulation:** Preparation of detailed plan(s) in all respects for the execution of a project for all kinds of activities to reduce mortality of infants will be made. Expected outcome objectives should be considered during planning. It might include maternal care, newborn care, childcare in respect of feeding, weaning, vaccination, etc.

F. **Implementation strategies:** Following strategies should be adopted by BMOH:
- *Increased supply of vaccine:* Timely order should be given to the district authority, so that out-of-stock situation can be avoided.
- *Uniform distribution of vaccines* in different subcenters according to need.
- *Deploying the retired manpower* for conducting outreach sessions.
- *Regular conduction of fixed and outreach session* (At subcenter and Anganwadi center)
- *Repeated training of different categories of staffs* like BPHN, PHN, Health worker (male and female) in vaccine administration, cold chain maintenance, etc., to improve the quality and coverage of services.
- *Appropriate management of cold chain* and appropriate use of vaccine carriers
- *Timely reporting of adverse events* to the appropriate authority
- *Arrangement of alternate vaccine delivery* for outreach session
- *Regular conduction of IEC:* Medical officer, BPHN/PHN, health supervisors, health workers, etc., can perform as health educator.
- *Target group:* Pregnant, lactating mother, adolescents, community leaders, etc.
- *Community participation:* By involving ASHA, AWW, ANM.
- *Regular meeting with staffs* to assess the problems in implementations.
- *Regular supervision of health worker* male and female by health supervisors, PHN, BPHN, Medical officers.

Q74a. **Causes of adverse events following immunization (AEFI) are being reported from subcenters of a block. Due to apprehensions among people, dropouts for immunization are also being increased.**

How AEFI are classified? Mention with examples. Describe important health managerial functions/ measures need to be under-taken to address and overcome the problem in that block. *(WBUHS, 2011, 2014, 2022; MGUB, 2023; ABKUB, 2010, 2023; VKSUAB, 2021; TRIU, 2023; PBDSUHSH, 2017; KIMS, 2019, 2021, ; RGUHS, 2008; TDMGRMU, 2014; DU, 2012; SMU, 2011; NU, 2014; GNSUB, 2022; MU, 2023; RUHL, 2024)/**AEFI includes events beyond side effect of vaccine*** *(MGUB, 2024)*

Ans: Adverse event following immunization **(AEFI)** is any untoward medical occurrence which follows immunization, and which does not necessarily have a causal relationship with the usage of the vaccine. The adverse event may be any unfavorable or unintended sign, abnormal laboratory finding, symptom or disease. If not rapidly and effectively dealt with, can undermine confidence in a vaccine and ultimately have dramatic consequences for immunization coverage and disease incidence. Most adverse reactions are mild, but life-threatening adverse events may occur.

AEFI are classified as follows:

Classification	Events
Vaccine reaction	An event caused or precipitated by active components of vaccines like fever, local pain, convulsion following DPT vaccine
Program error	These occur as a result of inappropriate storage, handling, preparation and administration of vaccines. **Examples:** Abscess following BCG vaccine, Toxic shock syndrome following measles vaccine
Coincidental events	Many a diseases/conditions occur in children unrelated to vaccination. However, when they occur shortly following vaccination, they may be thought of incorrectly due to the vaccine, e.g., febrile convulsion, sudden infant death syndrome or pneumonia following DPT vaccine
Injection reaction	Event resulting from anxiety about or pain from the injection itself, other than the vaccine. Examples include fainting, light-headache, dizziness, breath holding spells in younger children, which in some cases can lead to unconsciousness
Unknown	Events where cause cannot be determined

Surveillance and reporting of adverse events: Common minor reactions like mild fever, local swelling and redness, etc. These are resolved without any serious consequences. Therefore, there is no need to report these reactions except when there is change in nature, severity or frequency of occurrence of these reactions. Less common, but serious AEFIs such as inconsolable screaming, severe local reaction, injection site abscess, seizures, lymphadenitis, etc., are few of them. They are to be reported in the monthly reporting format. The Standard expert committee on call, consisting of an epidemiologist, pediatrician and a microbiologist may be required for investigation.

However, death, disability, severe adverse events requiring hospitalization or AEFI occurring in a cluster are to be reported immediately to the District Immunization Officer and investigated within 48 hours. For investigation of deaths following immunization, each state has constituted District AEFI committee to investigate the issue.

Q.4b A 9-month-old baby reported at PHC with complain of acute onset of vomiting and loose motion. On examination, it was found that the baby was severely dehydrated and in collapsing stage. Mother of the baby reported that the baby received a vaccine 5 hours back. *(TRIU, 2020)*

a. What could be the probable diagnosis and cause of this clinical condition?

b. Describe the management and also AEFI.

Ans: The probable diagnosis and cause of this clinical condition:

- **Toxic shock syndrome (TSS) after measles vaccination:** TSS occurs due to contamination of vaccine by **staphylococci**. It is likely to occur if there is delay in using the Measles vaccine after opening the vial. It is clinically characterized by sudden onset of high fever, vomiting and severe watery diarrhea within few hours of vaccination. Death may occur within 48 hours. Case fatality rate is high. It is preventable if the measles vaccine is used immediately after reconstitution.

- **Management** is symptomatic. In severe cases may need referral to hospital where life support system is available.
- **Coincidental events due to immunization (AEFI):** Many a diseases/conditions occur in children unrelated to vaccination. However, when they occur shortly following vaccination, they may be thought of incorrectly due to the vaccine, e.g., febrile convulsion, sudden infant death syndrome or pneumonia following DPT vaccine.
- **Management:** Common minor reactions like mild fever, local swelling and redness can be managed locally with no need for reporting. Less common, but serious AEFIs such as inconsolable screaming, severe local reaction, injection site abscess, seizures, lymphadenitis need to be reported to higher authority. But death, disability, severe adverse events requiring hospitalization or AEFI occurring in a cluster are to be reported immediately to District AEFI committee.

Q75. What is line listing. There is an outbreak of measles in one Tribal block. As MO I/C how will you manage the situation in your area and prevent the disease in future? *(SAMU, 2013, 2015)*

Ans: Line listing: Line listing of reported cases is very important to avoid duplication and rapid follow up action. It was started in the year 1989. All cases of AFP reported immediately to CMOH/District Immunization Officer/ SMO with the following details. The following components are included in the line list of cases:

- Name, age, gender of the patients
- Father's name, Mother's name with complete residential address and phone number
- Immunization status
- Date of onset of disease and date of reporting
- Provisional clinical diagnosis
- Laboratory investigations
- Hospital admission registration number
- Doctor's name, address and phone number
- Follow up action taken

Outbreak control measures in one tribal block: The following control measures are recommended:

- Early detection of outbreaks, house to house search and confirmed by serology.
- Isolation for 7 days after the onset of rash.
- Vaccine procurement and supply: There is a need for funding from State and Central Government and other National and International agencies, also supply of syringes and needles. Maintenance of cold chain for storage and transportation of vaccine is essential.
- Immunization of contacts within 2 days of exposure. If vaccine is contraindicated, immunoglobulin should be given within 3-4 days of exposure. Measles vaccine is given 0.5 mL, subcutaneously in right upper arm.
- The main target is to achieve more than 95% coverage by measles vaccine
- Active surveillance of case of measles
- To strengthen laboratory facilities in respect to measles (IgM antibody detection, molecular testing and also PCR, etc.)

As an MO/IC of a block, the above-mentioned activities should be accomplished.

- **Confirmation of the diagnosis:** The disease should be identified and confirmed by clinical history, epidemiological link history and laboratory support.
- **Verification of the outbreak:** The field staff will be instructed to make a line list of cases. Field staff may be deployed from other areas in such a situation if required. The number of cases will suggest the situation as an outbreak. All the activities to control such a situation will be applied here.
- **Defining the population at risk:** The affected area should be demarcated. The population should be counted and their sex and age identification is required to assess the load of problem.
- **Rapid active search for all such cases:** The staff will move house to house to collect data on diseased persons and to provide support to the family in terms of medicine and other ancillary management. Outbreak will be controlled by these measures.

- **Data analysis:** Time, Place and person distribution can be seen by this from the data collected by the staff.
- **Formulation of hypothesis:** This will deal with the source of infection, mode of spread, environmental factors and thus it will help the planners (MOICs) to take the control measures.
- **Planning of activities to manage the situation:** Formulation of management can be done from formulation of hypothesis. Paracetamol, emoluments, etc., can be given to the family members to allay the problems of affected persons.
- **Planning of activities to prevent further occurrence of the problem:** The problem affects the child population in measles. Vaccination is the primary mode of intervention, and this should be taken as priority measure. Other environmental issues also should be considered like isolation, prohibition of movement, non-mixing with affected children, etc.

Thus, outbreak of measles can be managed and prevented in future. Vaccination coverage should be achieved high and it should be maintained to keep the children safe from measles outbreak.

Write in brief the epidemiology, clinical features, major complications, treatment of measles in children. How will you prevent and control measles? What are the specific advantages of Edmonston–Zagreb stain vaccine over other measles vaccine? *(BNMUB, 2017, 2019; RGUHS, 2008, 2010; RUJH, 2018)*

Ans: **Epidemiology of Measles:**

Agent factors:

- **Agent:** Measles is caused by an RNA paramyxovirus, cannot survive outside the human body.
- **Source of infection:** Cases, carrier not known to occur.
- **Infective material:** Secretions of the nose, throat and respiratory tract of a case of measles during the prodromal period and the early stages of the rash.
- **Communicability:** Measles is highly infectious during the prodromal period and at the time of eruption. Communicability declines rapidly after the appearance of the rash. **The period of communicability is approximately 4 days before and 4 days after the appearance of the rash**. Isolation of the patient for a week from the onset of rash more than covers the period of communicability.

Host factors:

- **Age:** 6 months to 3 years
- **Gender:** No male, female variation
- **Immunity:** No age is immune if there was no previous immunity. One attack of measles generally confers lifelong immunity. Infants are protected by maternal antibodies up to 6 months. Secondary attacks are rare.
- **Nutrition:** Measles tends to be very severe in the malnourished child. Carrying 400 times higher mortality than a well-nourished children having measles. Severe malnourished children have been shown to excrete measles virus longer periods than better nourished children. Even in healthy children attack of severe measles may be followed by weight loss, precipitating the child into malnutrition.
- **Environmental factors:** In tropical zones, most cases of measles occur during the dry season. Epidemics of measles are common in India during winter and early spring (January to April). Population density, movement and lower socioeconomic condition are the precipitating factors.
- **Transmission:** Transmission occurs directly from person to person mainly by droplet infection and droplet nuclei, from 4 days before onset of rash until 4 days thereafter. The portal of entry is respiratory tract. Infection can occur through conjunctiva.
- **Incubation period:** Commonly 10 days from exposure to onset of fever and 14 days to the appearance of rash.

Write a brief note on the clinical feature of measles along with description of rash. *(WBUHS. 2010; BNMUB, 2015, 2018; SMU, 2012, BUMP, 2009; TDMGRMU, 2012; TRIU, 2023)*

Ans: There are three stages in the natural history of measles, prodromal, eruptive and postmeasles stage.

1. **Prodromal stage:** It begins 10 days after infection and lats until14 days. Symptoms are fever, coryza with sneezing, nasal discharge, cough, redness of eyes, lacrimation, photophobia, vomiting and diarrhea.

Koplik's spot: *(SSUHSA, 2013)*—1 or 2 day before the appearance of rashes, Koplik's spot developed on the buccal mucous membrane opposite the first and second lower molar teeth. They are small, bluish-white spots on red base, smaller than head of a pen, looking like grains of salt on a wet background, numerous and lasting for 3 to 4 days. **These spots are pathognomonic of measles.**

2. **Eruptive stage:** This stage is characterized by dusky red, macular or maculopapular rashes appear on the 4th day of fever, first behind the ears, then on forehead, face, neck and down the trunk and slowly extends to hands and lower extremities, taking 2 or 3 days. The rash may remain discrete, but often it becomes confluent and blotchy. At this stage, temperature is high, within 1 or 2 days, antibodies appear and symptoms of viremia subside.
3. **Post measles stage:** The child will loose weight and remain weak for a few days. There may be failure to recover and a gradual deterioration into chronic illness due to increased susceptibility to other bacterial and viral infections. There may be growth retardation and diarrhea, cancrum oris, candidiasis and reactivation of pulmonary tuberculosis.

The major complications of measles in children are given below:

- **Respiratory complications:**
  - Cough, pneumonia
  - Otitis media
- **Gastrointestinal complications:** Acute gastroenteritis associated with severe dehydration and diarrhea which contributes to malnutrition
- **Neurological complication:**
  - Febrile convulsion
  - Encephalitis
  - Subacute sclerosing panencephalitis
- **Ophthalmic complications:**
  - Conjunctivitis
  - Corneal ulceration

Prevention and control of measles: The following guidelines are important in combating measles:

- Achieving an immunization rate of over 95%
- Strengthen routine immunization against measles through successive generations of children. The measles are best protected by active immunization. Two doses of Measles vaccines are given in routine immunization.

Combined vaccine: Measles vaccine can be combined with other live attenuated vaccines such as measles, mumps, and rubella vaccines known as MMR vaccine and sometimes MR (measles and rubella).

Specific advantages of Edmonston–Zagreb stain vaccine over other measles vaccine are: The serological response to measles vaccine was tested in Bangladesh in groups of infants aged 4–6 months who received equal doses of Edmonston-Zagreb or Schwarz vaccine by subcutaneous injection or by aerosol. Seroconversion (as measured by the hemagglutination test) occurred in 62% of infants receiving Edmonston-Zagreb strain by injection compared with only 37% of those receiving Schwarz strain. **Seroconversion** occurred in 35% of those given Edmonston-Zagreb and 34% of those given Schwarz vaccine by aerosol. Edmonston-Zagreb strain appears more effective than Schwarz vaccine in this population and further studies are indicated in other populations where early measles immunization is desirable.

Q77. Describe the steps in planning and organizing immunization services in a subcenter area having 5 villages with 5,000 population, 2 ANMs and 5 ASHAs. *(DU, 2013)*

Ans: A subcenter has been considered here having a population of 5,000. At first, we have to find out approximate number of infants in the 5,000 population.

Crude birth rate in India (2015) is 20.00/1,000 population (Sample Registration System, Government of India, 2014). Some pregnancies do not result in a live birth, i.e., abortion and stillbirth may occur. The expected

number of live birth would be an under estimation of the total number of pregnancies. So, correction factor (pregnancy wastage) of 10% is added to the expected number of live birth.

Expected number of live birth/year in the subcenter = 20 × 5000/1000 = 100; Pregnancy wastage = 10% of 100 = 10; Expected total pregnant women in 1 year = 100 + 10 = 110; Expected number of infants in the subcenter the number of live-births minus number of death of infant. Considering IMR 40 per 1000, approximately four infants will die from 100 infants. So, the infants who will move for the second year of life will be 96 (100 – 4).

A subcenter is composed of five villages containing 5000 population. Approximately each village having 20 infants and children. Subcenter arranges immunization session on Wednesday at the office once in a month. Most of the children are taken by their mothers to the center for immunization. Remaining children are taken care of at their doorstep. Other Wednesdays of the month will be utilized for these infants and children with help of 2nd ANM. Outreach sessions are held in the village in ICDS center (AWC) or club house of the locality (community participation). There are five ASHAs in five villages; they are maintaining their own register of child along with uncovered child. These sessions are done every or alternate month depending upon the number of unvaccinated children, demand of the local people and leaders, participation of the voluntary workers (AWW, Link workers, etc.).

A good planning with micro-plan for manpower, logistic support, vehicular support, vaccine transport, site selection, publicity in the area is essential.

Record keeping is mandatory to follow the next activity in the locality. Children number, vaccination date, advice to mothers, area covered, AEFI, etc., are recorded and utilized later on for future activity.

Again in **fourth Saturday meeting**, convergence of activity regarding immunization of infants and pregnant mothers is held at Panchayat level in the presence of Panchayat member, ANM, ASHA, AWW and trained TBA, etc., and subsequent upgradation of Eligible Couple and Child Register **(ECCR)** is discussed and done.

Q78. Vaccination campaign Measles and Rubella is going to start in a block. Prepare appropriate health education plan for this campaign. *(WBUHS, 2019; ABKUB, 2022; TRIU, 2020; PBDSUHSH, 2018; MGUB, 2023)*

Ans: Careful planning is essential to the success of all health education activities.

Planning is the process of making thoughtful and systematic decisions about what needs to be done, how it has to be done, by whom, and with what resources. Planning is central to health education and health promotion activities. Everyone makes plans—for looking after their family, for cooking, and so on. You can build on experience you already have in planning, and apply it to health education.

Key questions to ask when planning

- *What* will be done?
- *When* will it be done?
- *Where* will it be done?
- *Who* will do it?
- *What* resources are required?

The purpose of planning in health education:

- Planning enables us to match our resources to the problem we intend to solve.
- Planning helps us to use resources more efficiently so that we can ensure the best use of scarce resources.
- It can help avoid duplication of activities.
- Planning helps us prioritize needs and activities. This is useful because our community may have a lot of problems, but not the resources or the capacity to solve all these problems at the same time planning enables us to think about how to develop the best methods with which to solve an existent problem.

Steps involved in planning health education activities: Planning is a continuous process. It doesn't just happen at the start of a project. If we are involved in improving and promoting community health,

we should make sure that we plan our activities. Planning can be thought of as a cycle that has six steps **(Fig. 10.15)**:

A. **Needs assessment** is the process of identifying and understanding the health problems of the community, and their possible causes. **Primary data sources** (observation, in-depth interviews, key informant interviews, and focus group discussions) and **secondary data sources** (health center and health post records, activity reports, and research reports) will help to identify local health problems.

B. **Identify priorities:** The problems are then analyzed so that priorities can be set for any necessary interventions. Measles and Rubella Vaccine Campaign (MRVC) is not highly acceptable in any locality as it is accomplished through injections. People may reject in many places. So people will be taken in confidence for the ultimate programs for MRVC.

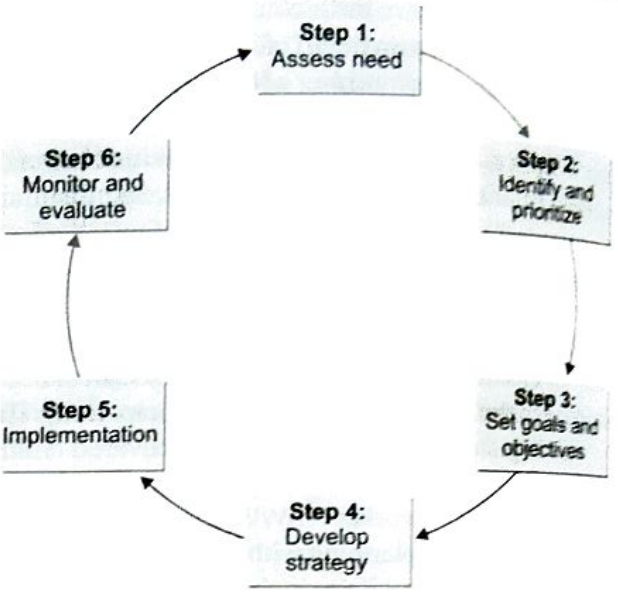


Fig. 10.15: Steps in planning health education activities. (*Source:* Henk van Stokkom)

C. **Setting goals and objectives:** In the campaign all eligible children of one subcenter area will be vaccinated with MR vaccine within 3 months

D. **Assessment of resources:**
- *Manpower:* Health care providers, community resources like community groups, local leaders, etc.
- *Material:* Vaccine and diluents, logistics, etc.
- *Money:* Allocation of fund

E. **Setting up of goals and objectives** can be made here and to achieve and fulfil the objectives community resources and health professionals can be utilized in education session.

F. **Strategy development:** Strategy development for health education is another step which will support the education of the local people for their motivation and participation in MRVC. During data collection to assess needs, resources the people have been sensitized and now is the time when strategy should be made. These may be group education of general people, of leaders and of schoolteachers in different education sessions. Education will motivate the stakeholders to adopt the MRVC for the better health of greater community.

G. **Implementation:** Implementation of health education programs should be monitored properly so that education objectives will be achieved and fulfilled.

H. **Monitoring and evaluation:** Evaluation after education program implementation will help us whether objectives have been achieved. If objectives are not achieved, then planning should be revised.

I. **Conclusion:** Thus, health education plan can be accomplished for **vaccination campaign of Measles and Rubella in an area including a Block** where government health functionaries, voluntary health workers, AWW, etc., are good in number. Their active support is important to implement this health education plan.

Q79a. What is the concept of cold chain and reverse cold chain? Describe the cold chain equipment. *(WBUHS, 2022; AFUH, 2022; BNMUB, 2020; ABKUB, 2015, 2022, 2023, 2024; VKSUAB, 2018, 2019; RGUHS, 2010; SAMU, 2008, 2011; TRIU, 2012, 2015, 2016; SSUHSA, 2015, 2020, 2021, 2022; TDMGRMU, 2010; SMU, 2009; DU, 2012; NU, 2012, 2014; KIMS, 2015, 2017; VNSGUS, 2023; GOAU, 2023; DBRAUA, 2024)*

Ans: The **"cold chain"** is a system of storage and transport of vaccines at the recommended (generally low) temperature from the manufacturer to actual vaccination site. The success of national immunization program

is highly dependent on supply chain system for delivery of vaccines and equipment with a functional system that fulfill 6 (six) rights of supply chain:

- **Right vaccine**
- **Right quantity**
- **Right place**
- **Right time**
- **Right condition**
- **Right cost**

Among the vaccine, polio is the most sensitive to heat and this should be kept at minus 20°C, if stored for a long period of time. Vaccine stored in freezer compartment are polio and measles. **Vaccines must be stored in the cold part but never allowed to freeze are "T" series vaccine (DPT, DT, TT, hepatitis B and diluents).**

At the health center, most vaccines (except polio) can be stored up to 5 weeks if the refrigerator temperature strictly kept between 2–8°C. Reconstituted measles and BCG vaccine can be kept at 2–8°C for maximum of 4 hours and JE vaccine for 2 hours. Used vial for these later three vaccines should not be kept in cold chain system in open vial policy. Return the unused vaccine vials from session site to the PHC on the same day in the cold chain through alternative vaccine delivery. The unused vials should be kept in a box leveled as **"returned unused"** in the ILR and can be used in subsequent session. If the vaccine is returned unopened for more than three times, these should be discarded.

Reverse cold chain: A system of storage and transport of samples from all children with acute flaccid paralysis (AFP) cases to recommended the reference laboratory. **For all reported AFP cases, two stool samples (each sample consists of thumb size 8–10 gram of stool) are to be collected** in a clean, **dry screw capped containers, need not be sterile and no preservative/transport media** is used, **24–48 hours apart.** Stool samples collected within 14 days of onset of paralysis have a higher virus isolation rate. Specimens are collected, leveled and transported to WHO accredited laboratory within 72 hours of collection. Reverse cold chain is maintained <8°C during transportation of stool samples. **A standard laboratory request form (LRF) should accompany stool samples.**

The cold chain equipment:

- **Walk-in cooler (WIC):** They are located in regional level, meant to store large bulk of vaccines up to **3 months and serve 4–5 districts.**
- **Deep freezers:** Available at state, district headquarters and teaching hospitals. It is a top opening refrigerator which maintains temperature at –20 to –40°C.
  The objectives of these deep freezers are as follows:
  - To store OPV and measles vaccine for long-term use
  - To prepare ice-packs in CHC/BPHC/rural hospital level.
- **Ice-lined refrigerators** *(ABKUB, 2019)*: Available in PHC, family planning center and postpartum unit. It has a single compartment for vaccine storage (0–8°C) equipped with baskets and lined by preinstalled and water filled ice-lining ready for use. A dial thermometer should be kept in the ILR and temperature should be recorded twice a day.
- **Cold boxes:** Available in peripheral centers and used for transportation of vaccines. Fully frozen ice packs are placed at the bottom and sides. The vaccines are first kept in cartoons or polythene bags. The vials of DPT, TT vaccines and diluents should not be placed in direct contact with the frozen ice packs.
- **Vaccine carriers (Fig. 10.16):** These are used at subcenter and village level. Vaccine-carriers are used to carry small quantities of vaccines for outreach sessions. Four fully frozen ice packs are used for lining the sides. The vials of DPT, TT vaccines and diluents should not be placed in direct contact with the frozen ice packs. The carriers should be closed tightly.
- **Day carriers:** Day carriers are used to carry small quantities of vaccines to a nearby session. Two fully frozen icepacks are used. It is used only for hours. Now-a-days it is not used.
- **Ice packs (Fig. 10.17):** These are rectangular shaped flat plastic bottles filled with water up to neck where a horizontal line is marked. When water is frozen into ice it is then called "icepack." The icepacks are

Fig. 10.16: Vaccine carrier.

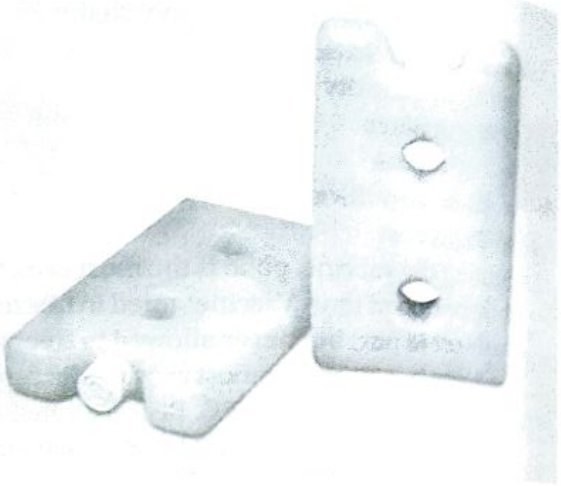


Fig. 10.17: Icepack.

prepared by filling with water up to neck of the cap and keeping them in deep freezer compartment. They are placed on their edges with little space for circulation of air but not flat on one another.

Q79b. What is open vial policy? *(ABKUB, 2022)*

Ans: This policy allows reuse of partially used multidose vials used under UIP in subsequent fixed and outreach immunization session up to 4 weeks (28 days) under certain condition hence reduce the vaccine wastage.

- Open vial policy applies for DPT, TT, hepatitis B, OPV and pentavalent vaccine, PCV
- Vaccine vials opened in session site can be used in more than one immunization session up to 4 weeks provided that:
  - Expiry date not passed
  - Vaccines are stored strictly under appropriate temperature range both during transport and storage at cold chain point
  - Vaccine vial septum has not submerged in water or contaminated
  - Aseptic procedure has been applied to withdraw all doses
  - VVM has not reached discard point
  - Open vials should never submersed in water
  - Ensure all open vials have recorded date and time of opening
- Open vials should never be submersed in water
- Ensure all open vials have recorded date and time of opening
  - At the end of the session, all open vials should be returned to cold chain point
  - They are segregated as re-use DPT, TT, Hep B and pentavalent vaccine vails maintaining above criteria
- All open and up-open vials should be transported in a zipper bag in the vaccine carrier and recorded in stock register.
- Well-sealed conditioned ice packs should be used in vaccine carriers and should not be allowed to accumulate where vaccine vials and diluents are stored.

SHORT NOTES AND RELEVANT QUESTIONS

Q80. What are the types of immunity? *(BNMUB, 2005; ABKUB, 2022)*

Ans: There are **two types** of immunity, active and passive.

1. **Active immunity:** It is the immunity which an individual develops as a result of infection or by specific immunization and is usually associated with presence of antibodies or cells having a specific action on

the microorganism concerned with a particular infectious disease or its toxin. It depends on humoral and cellular responses of host. It is acquired in three ways:

- Following infection like chickenpox, rubella and measles
- Following subclinical infection like polio, diphtheria
- Following immunization (vaccination) by live, killed vaccines and toxoids

2. **Passive immunity:** When antibodies produced in one's body (human or animal) are transferred to another person to provide protection against disease is known as passive immunity. The body does not produce its own antibodies but depends upon readymade antibodies. Already prepared antibodies are given here. It develops rapidly/immediately for temporary period of time. It may be induced by:
   - Administration of antibody containing preparation (immune globulin or antisera)
   - By transfer of maternal antibody across placenta, breast milk containing protection-giving antibody (IgA).

Q81. Differentiate between active and passive immunity. *(BNMUB, 2022; SMU, 2011; DU, 2015; SDVPG, 2023)*

Ans:

Active immunization	*Passive immunization*
Administration of antigens. **Example:** BCG, DPT, OPV	Administration of antibody. **Example:** ATS, ADS
Immunity is produced after 10–15 days	Immunity produced instantly
Immunity lasts longer	Immunity lasts shorter
Usually not associated with reactions	Often associated with reactions
It is given before exposure to disease	It is given after exposure to disease
This is not used for treatment purpose	This is often used as a part of treatment **Example:** Tetanus, diphtheria
This is more useful	This is less useful

Q82a. Universal Immunization Program (UIP). *(BNMUB, 2004; SAMU, 2012; BUMP, 2013)*

Ans: WHO officially launched a global immunization program known as Expanded Program on Immunization (EPI) in **May 1974** to protect all children of the world against six vaccine preventable diseases (VPDs). The Government of India launched **EPI in January 1978**. The objectives were reduction of morbidity and mortality resulting from VPDs of all children. The program was sponsored by UNICEF renamed as Universal Child Immunization. Immunization Program (UIP) started in **India since 1985**. EPI was modified as Universal Immunization Program (UIP) to be implemented in phased manner to cover all districts in the country by 1989–90 with the one of largest health program in the world. Ministry of Health and Family Welfare, Government of India provides several vaccines to infants, children and pregnant women through the **UIP.**

It has two vital components:

1. Immunization of pregnant women against tetanus
2. Immunization of children against vaccine preventable diseases.

Q82b. Discuss vaccine preventable diseases and vaccines under UIP. *(WBUHS, 2008; SMU, 2010)*

Ans: **Vaccine preventable diseases are enumerated below:** Tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, hepatitis B, measles, rubella, Japanese encephalitis, meningococcal meningitis, *Haemophilus influenzae*, *Rotavirus* diseases.

Vaccines used under UIP:

- **Bacillus Calmette-Guérin (BCG) vaccine**
- **Oral polio virus (OPV) vaccine**
- **Hepatitis B vaccine**
- **Pentavalent vaccine**

- **RVV**
- **PCV**
- **IPV**
- **Measles/MR vaccine**
- **Japanese encephalitis vaccine (JE)**
- **Diphtheria, pertussis, tetanus (DPT) vaccine**
- **Td/TT**

Newer strategies under UIP for strengthening immunization: Support for alternate vaccine delivery from PHC to subcenter and outreach session.

- Deploying retired manpower to carry out immunization activities in urban slums and underserved areas
- Mobility support to district immunization officer for monitoring and supportive supervision.
- Training of ANM, ASHA, etc.
- Support for mobilization of children to immunization session site by ASHA, self-help groups, etc.

Q82c. Explain herd immunity with examples. *(BNMUB, 2005; GNSUB, 2022; TRIU, 2016; SSUHSA, 2011, 2022, 2023; TDMGRMU, 2011, 2012; NU, 2013; RGUHS, 2012; KIMS, 2022; RUJH, 2023)*

Ans: Herd immunity: It develops when vaccination of proportion of population (or herd) provides protection to unprotected individuals. When large number population are immune lower the likelihood that a susceptible person will come in contact with infectious agent. The elements which contribute to herd immunity are:

- Occurrence of clinical and subclinical infection
- Immunization of herd
- Herd structure

Examples: Severe measles epidemic in Faroe Islands in 1854. Population of this area had no experience of measles previously. The epidemic wave declined with build up of herd immunity following natural infection.

Q82d. Different agents for active immunization. *(ABKUB, 2005)*

Ans: Active immunity developed following immunization with an antigen which may be killed, a live attenuated microbes or toxoid. The following vaccines and toxoids are being used for active immunization. **examples.** BCG vaccine, OPV, IPV, hepatitis B vaccine, DPT, TT, *Rotavirus* vaccine, measles vaccine, JE vaccine PCV and 17D vaccine, etc.

In public health sector, national immunization schedule has been prepared to operate the program at field levels in smoother way maintaining uniformity in time, place and person. The agents are BCG, OPV, hepatitis B, IPV, pentavalent vaccine, measles and rubella and in some states with their disease prevalence JE and rotavirus. These all are active immunization. Other preparations are also available commercially from outside like pneumococcal vaccines, chickenpox vaccine, etc.

Yellow fever vaccine is also given person traveling to African countries and countries where yellow fever are endemic.

Q82e. What is the objective of antenatal immunization of mothers against tetanus? *(KIMS, 2019)*

Ans: National Technical Advisory Group on Immunization (NTAGI), MH and FW has recommended the replacement of TT vaccine with Td vaccine in India's immunization program for all age groups including pregnant mother in the year 2017 onwards.

As per vaccine preventable diseases surveillance data in India, majority of diphtheria case occurring in the age group of 5 years and above about 77% and 69% respectively in 2017 and 2018 mostly unvaccinated. In 2016, diphtheria outbreak in Kerala, about 79% case occurred in the more than 10 years age groups. Since 1999, tetanus mortality reduced by 80% but due to outbreak, the gaps were increased in diphtheria protection.

With the experience of outbreaks, Td is recommended instead of TT for older children and adolescents as well as during pregnancy to protect against maternal and neonatal tetanus and diphtheria during prenatal

- **RVV**
- **PCV**
- **IPV**
- **Measles/MR vaccine**
- **Japanese encephalitis vaccine (JE)**
- **Diphtheria, pertussis, tetanus (DPT) vaccine**
- **Td/TT**

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With the experience of outbreaks, Td is recommended instead of TT for older children and adolescents as well as during pregnancy to protect against maternal and neonatal tetanus and diphtheria during prenatal

care. Vaccination during pregnancy boost immunity those are unvaccinated during routine immunization and also help to curtail diphtheria outbreaks.

Q82. Discuss the advantages of using auto-disable syringes in National Immunization Program (NIP). *(WBUHS, 2017; SSUHSA, 2023)*

Ans: Auto-disable (AD) syringe **(Fig. 10.18)** is a syringe that cannot be reused after a single use. Manufacturers incorporate a mechanism to lock the plunger within the barrel of syringe. Thus, a **single injection is given to make the syringe inoperable for being re-used for next time.** Three types of syringes are supplied under the NIS for the purpose of vaccine administration:

1. 0.1 mL AD syringes
2. 0.5 mL AD syringes
3. 5 mL disposable syringes.

Fig. 10.18: Auto-disable syringe.

The auto-disable syringes are used for the administration of the appropriate vaccines and the disposable syringe is used for reconstitution of vaccines where needed. The AEFI (adverse event following immunization) kit contains other types of syringes like, insulin type (with 0.01 mL graduations and 26 G needle), 5 mL disposable syringes with 24 and 26 G needles.

Uses of AD syringes in NIP: The 0.1 mL AD syringe comes with the needle gauge of 26 G and is used for intradermal injections: BCG and fractional dose of IPV are given by this. The 0.5 mL AD syringe is used for the other injectable vaccines.

Recommended procedure for its safe disposal after use under the immunization program: Needle hub of the AD syringe is cut immediately after administering the injection using the hub cutter. The cut needles will get collected in the puncture-proof container of the hub cutter. The broken vials are stored in a separate white sturdy and puncture proof container. The plastic portion of the cut syringes and unbroken (but discarded) vials are segregated and stored in the red bag or container.

White bag is used for general waste like wrappers like needles. The red, white bag and puncture-proof container of the hub cutter are sent to PHC for disinfection and disposal by the designated person at the PHC and finally to a common bio-medical waste treatment facility (CBWTF).

Q83. Differentiate between live and killed vaccine. *(BNMUB, 2008)*

Ans: This can be presented through a table. It is noted that vaccine may have exception.

Characteristics	Live vaccine	Killed vaccine
Duration of immunity	Longer	Shorter
Effectiveness of protection	Greater	Lower
Need for adjuvant	No	Yes
Immunoglobulins produced	IgA and IgG	IgG
Mucosal immunity produced	Yes	No
Cell-mediated immunity produced	Yes	No
Reversion to virulence	Possible	No
Excretion of vaccine virus and transmission to nonimmune contact	Possible	No
Stability at room temperature	Low	High
Interference by other viruses in host	Possible	No
Example	BCG, measles, polio vaccine, etc.	IPV, cholera vaccine, pertussis vaccine, etc.

Q84. Live vaccines are potent immunizing agents than killed vaccine—why? *(WBUHS, 2008)*

Ans: Live vaccines like BCG, measles, polio are prepared from live organisms. These organisms have been passed repeatedly in laboratory in tissue culture or chick embryos and have lost their capacity to induce full blown disease but retain their immunogenicity. Killed vaccines like Hepatitis-B are prepared when organisms are killed by heat or chemicals and when infected into the body stimulate active immunity. Live vaccines are more potent immunizing agents then killed vaccines because:

- Live organisms multiply in the host and resulting antigenic dose is larger than what is injected.
- Live vaccines have all the major and minor components.
- Live vaccines engage certain tissues of the body like intestinal mucosa by oral polio vaccine.
- There may be other mechanisms like persistence of latent virus.

Q85. Write a short note on vaccine vial monitor (VVM). *(BNMUB, 2014; RGUHS, 2013; TRIU, 2013, 2023; TDMGRMU, 2010; BUMP, 2013; NU, 2013; RUJH, 2023; KIMS, 2019)*

Ans: The vaccine vial monitor is a simple tool which enables the vaccinator to know whether the vaccine is potent at the time of administration. On the vaccine vial, there is a circle, inside the circle 1 square is printed which is white and lighter than the color of the circle indicates vaccine is potent and can be used **(Fig. 10.19)**. If the color of the square is darker than the circle or same color as circle mark, the vaccine should be discarded. VVM is very heat sensitive, change of color due to increased temperature above recommendation. This helps in reduction of vaccine wastage.

Symbol	Explanation	Stage
	The inner square is lighter than the outer circle. If the expiry date has not passed, USE the vaccine	I
	As time passes the inner square is still lighter than the outer circle. If the expiry date has not passed, USE the vaccine	II
	Discard point: The color of the inner square matches that of the outer circle. Do not USE the vaccine	III
	Beyond the discard point: Inner square is darker than the outer circle. Do not USE the vaccine	IV

Fig. 10.19: Picture of vaccine vial monitor.

Q86. Newer vaccines in national immunization schedule. *(ABKUB, 2017)*

Ans: Rotavirus vaccine, PCV, JE and IPV.

Q86a. Rotavirus vaccine (RVV).

Ans: The new Rotasiil product is an oral liquid vaccine in single dose small plastic tubes. MoHFW has issued letter to 11 states informing them about the product switch. In these 11 states/UTs which have the lyophilized product (two dose vial, needs reconstitution) the single dose liquid product will be supplied henceforth. Transition will happen in phases as the states exhaust the stock of the Rotasiil-lyophilized. Rotasiil liquid is interchangeable with Rotasiil lyophilized and Rotavac.

Live attenuated, oral liquid vaccine, available in small plastic tubes, single dose in each tube and five such tubes attached to a strip, carton pack is of 10 strips (five single dose small tubes attached to a strip, total 50 doses), each dose is of 2 mL, can be used till the VVM on stem of tube is in usable stage.

- **When to give:** Three doses to be given at 6, 10 and 14 weeks all over India, can be given till one year of age.
- **Route and dose:** 2 mL of vaccine are given orally.

Figs. 10.20A and B: (A) Rotavirus vaccine (RVV) vial liquid; (B) Lyophilized.

- **Storage:** Heat sensitive vaccine and to be kept at 2 to 8°C at all levels of the supply chain.
- **Open vial policy:** Since the new Rotasiil product is presented as single dose tube, open vial policy is not applicable.
- **Advice for use:** Open the vaccine carrier and **remove only one strip with five small plastic tubes attached** to it. Check the VVM before administering the vaccine. Ensure that separate single dose plastic tubes are to be used for each child. Take out from vaccine carrier five small plastic tubes attached to a strip and place it on ice pack. Use each tube as a single dose vaccine for each beneficiary. Remove the cap from the tube and the entire amount of vaccine in each tube needs to be given by squeezing it, position the tube at 45° angle, administer 2 mL into the mouth of the baby SLOWLY in drops.

Disposal of used plastic tubes: Empty plastic tube vials should be disposed in red plastic bag. At the end of the session, the unopened tubes of the Rotasiil liquid vaccine should be sent back to the cold chain point with other vaccines and should be used in the next session on priority basis before opening a new strip with five tubes **(Figs. 10.20A and B)**.

Contraindications for the Rotasiil-liquid will be the same as Rotasiil lyophilized:
- Known or documented allergic reaction to vaccine
- H/o intussusception/abdominal surgery/intestinal malformation
- Known case of immunodeficiency

Rotavirus vaccine has been incorporated in UIP-justify. *(WBUHS 2021)*

Rationale for introduction of RVV in the National Immunization Schedule: Diarrheal diseases are the leading cause of childhood mortality in India and Rotavirus is responsible for nearly 40% of moderate to severe diarrhea in under-five children.
- Apart from the burden of death, diarrhea is also an important contributor to long-term nutritional deficiency like stunting, wasting, malnutrition and loss of cognitive development.
- Rotavirus is highly contagious and resilient therefore sanitation and hygiene improvements have less impact on transmission of rotavirus diarrhea.
- The incidence of rotavirus infection is similar in both developed and developing countries. However, more than 80% of rotavirus deaths occur in developing countries, where poverty, malnutrition and limited access to health services exacerbate the problem.
- It has been observed that rotavirus infects Indian children at an age younger than the children in developed countries. The exposure is still earlier among children in the poorest, rural households with the highest risk of mortality.

- Marked declines have been observed in hospitalizations and deaths due to rotavirus in countries that have introduced rotavirus vaccines under National Immunization Programme, e.g., Australia, USA, Mexico and Brazil. Therefore, WHO has recommended inclusion of *Rotavirus* vaccines in National Immunization Programme of all countries, particularly in South and South-Eastern Asia.

Q86b. Pneumococcal conjugate vaccine (PCV). (WBUHS, 2023)

Ans: It protects infants and young children against disease caused by the bacterium *Streptococcus pneumoniae*. It is given in select states. Pneumococcal conjugate vaccine has been advocated in the NIS under UIP since May 2017. In the first phase, the vaccine was rolled out in Himachal Pradesh and parts of Bihar and Uttar Pradesh. Introduction in Madhya Pradesh and Rajasthan will follow and eventually be expanded to the country.

Vaccine type: This is killed, conjugate vaccine (13 serotypes). It is a liquid preparation (**Fig. 10.21**).

When to give: The vaccine is given as two primary doses at 6 and 14 weeks of age followed by a booster dose at 9–12 months of age.

Route, site and dose: PCV is given as intramuscular (IM) injection in anterolateral aspect of right mid-thigh, dose—0.5 mL. It should be noted that pentavalent vaccine and PCV are given as two separate injections into opposite thighs.

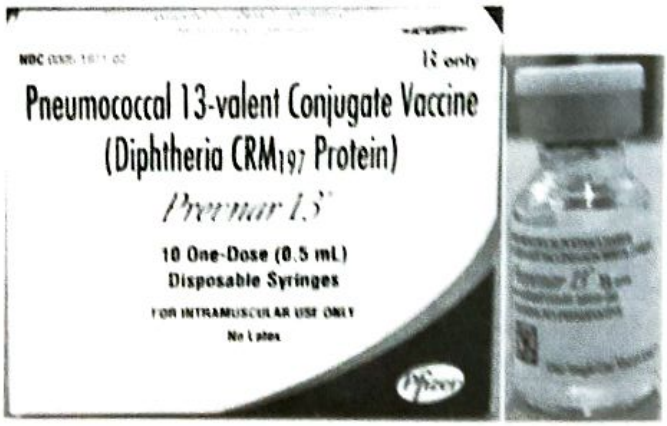

Fig. 10.21: Picture of PCV.

Storage: Between +2°C to +8°C. Discard if the vaccine has been frozen. Yes, suspected frozen vials of PCV can be tested for freezing through **'shake test'** procedure like that for DPT, Pentavalent, TT, Hep B vaccines.

Justification of PCV: Pneumonia kills more children under-five years of age in India than any other infectious disease. The pentavalent vaccine which was included in the NIS earlier protects against *Haemophilus influenzae* type b (Hib) pneumonia. Now, the introduction of PCV in the UIP will reduce child deaths from pneumococcal pneumonia as well.

Q86c. Japanese encephalitis (JE) vaccine. (BNMUB, 2014; TDMGRMC, 2008; TRIU, 2021; SSUHSA, 2013, 2015, 2022; KMS, 2017)

Ans: It gives protection against Japanese encephalitis disease. This vaccine is an integral part of Universal Immunization Program in 83 endemic districts of Uttar Pradesh, Assam, West Bengal and Karnataka targeting the children of 1–15 years. It is cell culture-derived live, attenuated vaccine using SA 14–14–2 strain of JE virus. **Phosphate Buffer Saline is used as diluents for the vaccine (Fig. 10.22).** Once the cap is opened for reconstitution the VVM lost, so before reconstitution it should be ensured that VVM is a usable stage and vaccine is within the date of expiry. Once the cap is opened for reconstitution the VVM lost.

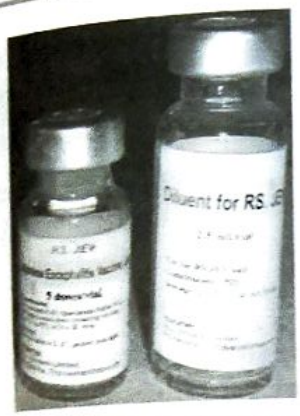

Fig. 10.22: Picture of JE vaccine.

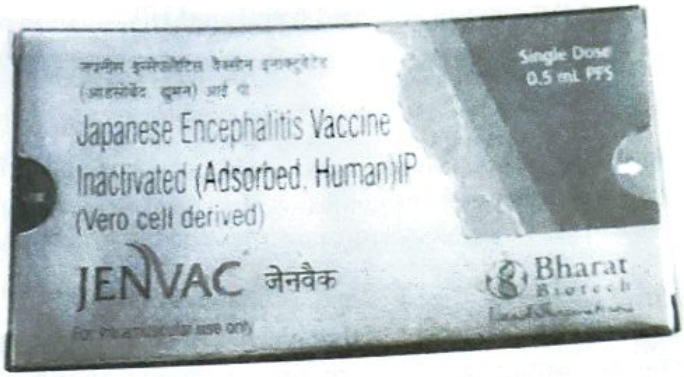

Fig. 10.22a: Picture of inactivated JE vaccine.

When to give: JE vaccine is given in two doses first dose is given at 9 completed months-12 months of age and second dose at 16–24 months of age.

Route, dose and site: It is given as subcutaneous injection, 05 mL, left upper arm.

Purified inactivated Japanese encephalitis vaccine (This vaccine was introduced in India)

JENVAC is a single dose inactivated Japanese encephalitis (JE) vaccine. This vero cell derived vaccine is prepared from an Indian strain (Kolar-821564XY) of the JE virus. JENVAC has been developed by Bharat Biotech International Limited in collaboration with the National Institute of Virology, India. **Phosphate Buffer Saline is used as diluent**. This vaccine is available only in the National Immunization Schedule of the Government of India.

Special precautions for storage: Should not be used after expiry date, stored between +2°C to +8°C. Should not be freezed.

Contraindications:

- Severe allergic reaction after a previous dose of JENVAC **(Fig. 10.22a)**.
- Do not administer intravenously, intradermally or subcutaneously
- Administer after shake test

When to give: It is administered in a two-dose schedule at 9 months and 16–24 months, to children.

Route, dose and site: It is administered by intramuscular route. The preferred sites are anterolateral aspect of the thigh for children or the deltoid muscle of upper arm for adults.

Gap: This vaccine is given in two doses. Dose 2 is scheduled 28 days after Dose 1. It is very important that you receive both doses of the vaccine at least 7 days before you plan to travel to endemic countries.

Inactivated polio vaccine (IPV)/injectable polio vaccine/salk vaccine. *(ABKUB, 2007, 2018; BNMUB, 2017, 2019; DU, 2016; NU, 2016)*

Inactivated poliomyelitis vaccine (IPV): It was developed by Dr Jonas Salk in 1955. Each vial contains 2.5 mL having five doses multi-dose vial along with VVM, it also contains batch no, Mfg. and expiry date. This vaccine has recently started being given in fractional doses. India is the first country to introduce fractional doses of the IPV as a way of protecting babies from polio during the current global IPV shortage **(Fig. 10.23)**.

When to give: 6, 14 weeks of age and **third dose** at **9–12 months of age from 1st January 2023 under UIP**.

Route, dose and site: Intradermal, 0.1 mL, right upper arm.

Fig. 10.23: Inactivated polio vaccine

Comparing IPV and fractional IPV. *(WBUHS, 2019)*

Criteria	IPV	Fractional IPV (fIPV)
Volume per dose	0.5 mL	0.1 mL
Schedule	1 dose: 14 weeks	2 doses: 6 weeks and 14 weeks
Administration	Intramuscular (IM) injection	Intradermal (ID) injection
Site of administration	Thigh	Upper arm
Syringe used	0.5 mL AD syringe	0.1 mL AD syringe

It has to be noted that studies have demonstrated that 2 fIPV doses at 6th and 14th weeks intradermally (ID) provides higher seroconversion rates than a single doses of IPV given at 14th weeks intramuscularly (IM).

Q87. Difference between Salk and Sabin vaccine. *(WBUHS, 2019; SMU, 2014; NU, 2013)*

Ans:

Salk vaccine (IPV)	Sabin vaccine (OPV)
Jonas Salk introduced Salk vaccine in 1955	Albert Sabin introduced Sabin vaccine in 1961
Killed formalized virus	Live attenuated virus
Given intramuscular (IM)	Given orally
Induces circulating antibody but no local (intestinal) immunity	Induces both humoral and intestinal immunity
Prevents paralysis but not prevent reinfection by wild polio virus	Prevents not only paralysis but also intestinal reinfection
Not useful in controlling epidemics	Effective in controlling epidemics
More difficult to manufacture	Easy to manufacture
Costly	Cheaper
For storage and transport not required stringent condition	For storage and transport required subzero temperature

Q88. Describe routine immunization and intensified pulse polio immunization (IPPI). *(BNMUB, 2010)*

Ans:

	Routine immunization	IPPI
Age	It is given at birth (OPV0), at 6, 10, 14 weeks and as booster dose as 16–24 months with bOPV	It is the sudden, simultaneous, mass administration of OPV to all children below 5 years regardless of previous immunization
Type of vaccine	Bivalent bOPV and IPV	Bivalent bOPV
Ice packs	Conditioned ice pack is used	Hard frozen ice pack is used
Reuse of vaccines	Usually not reused	Reused on the days of home visit also
Storage	In ILR	In ILR/deep freezer

Q89. Discuss pulse polio immunization (PPI)/intensified pulse polio immunization (IPPI)/Pusle Polio Programme is still going on. *(WBUHS, 2022; AKUB, 2022; BNMUB, 2006, 2012; VKSUAB, 2018; YSRUHSAP, 2018; RGUHS, 2010; TRIU, 2016; TDMGRMU, 2008; SSUHSA, 2006, 2010)*

Ans: Pulse polio immunization (PPI): Government of India conducted first round of PPI in December 1995 and January 1996. It is carried out through national and sub-national immunization day. **The term "pulse" has been used to describe sudden, simultaneous, mass administration of two drops of OPV on a single day to all children of 0–5 years of age, regardless of previous immunization.** Mass campaign of IPPI probably acts by flooding the environment with vaccine virus, so that probability of encountering the virus is low or rapidly increasing population immunity. Sero-conversion is also higher. There is no contraindication to IPPI. Even very sick children are immunized. Particular attention is paid to urban slums and other clusters of low immunization coverage. Now-a-days it is called as **Intensified Pulse Polio Immunization (IPPI).**

The term intensified means first day immunization at vaccination site (booth) followed by home visits for vaccination of missed children if any.

Risk of VAPP and VDPP and future plan of polio immunization. *(NU, 2017)*

Ans: The attenuated polio virus in OPV can undergo genetic changes during replication. In communities with low vaccination coverage, rarely it may result in vaccine derived polioviruses (VDPV) that can cause paralytic polio indistinguishable from disease caused by WPV but can be distinguished by laboratory analysis.

The incidence of VAPP has been estimated at 4 cases/1000,0000 birth cohort per year in the countries using OPV, it occurs in both OPV recipients and their unimmunized contacts.

The last global case due to WPV Type-2 was reported at Aligarh, India in 1999. **Most of the global cases due to VDPVs (97%) as well as VAPP (40%) are due to type-2 polio virus.**

In Polio Endgame Strategy, thus switch to bOPV from tOPV has been done. Now only Type-1 and Type-3 components are being used in bOPV.

However, at the time of switch the recent birth cohort are at risk of VDPV and wild polio virus Type-2 due to silent/ongoing transmission of VDPV Type-2 and also potential leakage of wild polio virus Type-2 in case of accidental/intended leakage of virus from a laboratory.

To mitigate this risk, inactivated polio virus vaccine was introduced prior to the tOPV-bOPV switch in April 2016.

Current strategy: fIPV given at 6 and 14 weeks along with bOPV at birth and subsequent three doses at 6, 10 and 14 week, booster dose 16–24 months as well as IPPI.

Role of IPV in polio eradication—explain. *(WBUHS, 2010)*

Ans: IPV includes humoral antibodies (IgM, IgG and IgA serum antibodies) but does not induce intestinal or local immunity. **The circulating antibodies protect the individual against the paralytic polio** but do not prevent re-infection of the gut by wild viruses. The wild polio virus (WPV) still multiplies in the gut and could be source of infection to others. In case of epidemic of poliomyelitis IPV is not suitable for the following reasons, immunity not rapidly achieved as more than one dose is required, injections are avoided during epidemic as they likely to precipitate paralysis.

Concept of sequential administration of IPV and OPV: Countries like Central and Eastern Europe, Southern Africa, Middle East, Far East adopted sequential schedules of 1–2 doses of IPV followed by ≥2 doses of bOPV. The combined schedules of IPV and bOPV reduce or prevent vaccine associated paralytic poliomyelitis (VAPP) and maintaining high level of humoral immunity by IPV and intestinal mucosal immunity produced by bOPV. Thus, these schedules of activities are economical where resources are limited by reducing the number of doses of IPV. These combined approach is effective in preventing poliomyelitis caused by WPV as well as VAPP has been documented in several studies. From the above discussion, we concluded that role of IPV is useful in polio eradication.

Switch from trivalent to bivalent OPV as a polio endgame plan-comment *(WBUHS, 2017)*/**Final push for polio eradication.** *(TRIU, 2020, 2023; VBUJH, 2023)*

Ans: In polio endgame plan, bivalent OPV (bOPV) **(Fig. 10.24)** are being used. It contains Type 1 and Type 3 polio virus. The first stage of OPV withdrawal involved a global synchronized cessation of trivalent OPV vaccine (tOPV) use between 18th April and 1st May 2016 replacing tOPV with bOPV containing only Type 1 and 3 poliovirus and thus withdrawing OPV Type 2 from all immunization activities called **"the switch"**. Once switch is made, **tOPV will no longer be used anywhere in the world. It should be destroyed from store, strict ban on manufacture of tOPV.**

Fig. 10.24: Oral polio vaccine.

The switch is necessary for the following reasons:

- No wild polio virus Type 2 has been recorded since 1999.
- The risk of vaccine associated paralytic poliomyelitis (VAPD) and vaccine derived poliovirus (cVDPV) was found mostly due to Type 2 polio virus in the community.
- Mutation due to Type 2 polio virus.

On the other hand, introducing at least one dose of inactivated polio vaccine (IPV) will ensure that a substantial proportion of population is protected against Type 2 serotype. In the end game plan, strengthening of routine immunization activities are equally important.

The following activities should be undertaken:

- Two doses of IPV will be introduced through routine immunization system in 6th and 10th weeks of age of the child.
- The outbreak of WPV and cVDPV are closely correlated to weakness of routine immunization system.
- Infrastructure should be used systematically to strengthen routine immunization.
- Infant immunization coverage should be improved specially in focus group which is reported uncovered worldwide.
- Third dose of DPT containing vaccine will be used to measure the routine immunization coverage improvement.

Q83. Explain shake test.

Ans: The **"shake test"** is used to check whether freeze sensitive vaccine have been damaged by exposure to temperature below 0°C. After it has thawed, a vial of vaccine that has been frozen no longer has the appearance of a cloudy liquid, tends to form flakes that settle down at the bottom of the vial.

There is only one way to conduct a shake test. The protocol must not be altered. The procedure is as follows:

Test vial: Take a vial you suspect that may have been frozen. This is test vial.

Frozen control vial:

- Take a vaccine vial of same antigen, same manufacturer, same batch number as the suspect vaccine vial you want to test.
- Freeze solid this vial at -20°C overnight in the deep freezer. This frozen control vial and labeled it accordingly to avoid its use.
- Let it thaw, do not heat it.
- Hold the control and test vial together between thumb and forefinger and vigorously shake the vials for 10–15 seconds.
- Place both the vial to rest on flat surface, side by side observe them for 30 minutes
- Compare for rate of sedimentation as shown in **Figure 10.25**.

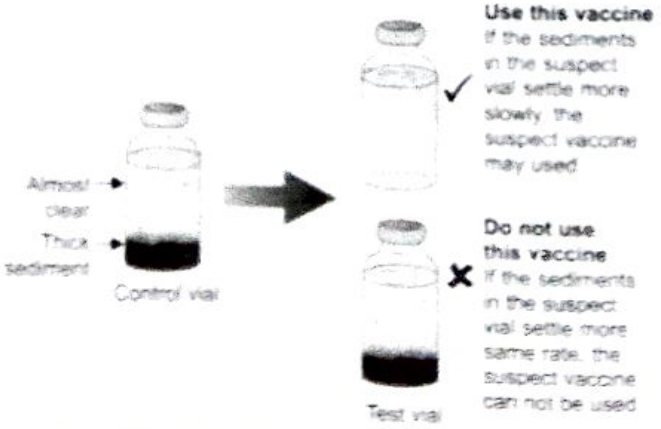

Fig. 10.25: Comparison of frozen vial and suspect test vial

- If the sedimentation in the **"test vial"** is slower than the **"frozen control vial"**, the has not been damaged, it passes the shake test. Use the vaccine batch, it is not damaged.
- If the sedimentation is same in both the vials or if the sedimentation is faster in **test vial** than **frozen control vial**, the vaccine is damaged, it failed in shake test. Do not use. Notify your supervisor.

Write short notes on BCG vaccine. *(WBUHS, 2009; RGUHS, 2011; SMU, 2012; KIMS, 2013; TDMGRMU, 2008, 2013; ABKUB, 2013)*

BCG stands for Bacillus Calmette-Guerin vaccine **(Fig. 10.26)**. Calmette and Guerin, two French scientists began attenuating avirulent stain of *M. bovis* in 1906, after a period of 13 years 230 subcultures were done to evolve a stain named BCG. It was introduced in 1948. WHO recommended the **"Danish 1331"** for production of BCG vaccine. Since 1967, BCG laboratory at Guindy, Chennai has been using **"Danish 1331"** for production of BCG vaccine. It is a vaccine-freeze-dried vaccine. **It is given to infants to protect them from tubercular meningitis and disseminated TB. Normal saline used as diluents for reconstituting the vaccine as distilled water may cause irritation and can be used within 3 hours, left over vaccine is discarded.**

Fig. 10.26: BCG vaccine.

When to give: BCG vaccine is given at birth or as early as possible till 1 year of age.

Route, site and dose: BCG is given as intradermal injection in left upper arm to maintain **uniformity and to help surveyors in verifying the received of the vaccine,** 0.1 mL administered through Tuberculin syringe (26 gauge).

Explain phenomena after BCG vaccination.

Diameter of 5 mm is developed at the time of injection.

A series of reaction occurs after the BCG vaccination.

Duration	Type of reaction
First two week	No reaction seen
3rd week	Papule
4th week	Vesicle
5th week	Pustule
6th week	Ulcer
7th week	Crust formation
8th to 12th week	Scar formation

The vaccinated scar is about 4–8 mm in diameter. It is circular, superficial and permanent. In case of overdose the scar is irregular and large.

Write a short note on Mantoux test. *(BNMUB, 2005; RGUHS, 2007, 2011)*

The Mantoux test is carried out by injecting intradermally on the flexor surface of the left forearm 1 TU of PPD in 0.1 mL. WHO advocates a preparation known as **"PPD-RT-23 with Tween 80"**. The result of test is read after 72 hours. Tuberculin reaction consists of erythema and induration. Since erythema is difficult to measure, induration alone is measured (horizontal transverse diameter of induration in millimeters using a transparent plastic ruler). **Reactions exceeding 10 mm are considered positive, 6–9 mm doubtful and less than 6 mm negative.**

Positive result in children may indicate that the child may suffer from tuberculosis. In other case, it is nothing but past infection with tuberculosis organism.

Q96. Explain hepatitis B vaccine and vaccination schedule for children. *(WBUHS, 2010; RGUHS, 2013, 2014, 2015; ABKUB, 2000; BNMUB, 2020; SSUHSA, 2021; GOAU, 2023)*

Ans: Hepatitis B vaccine **(Fig. 10.27)** is a recombinant DNA vaccine which protects from hepatitis B virus infection. Besides hepatitis B, the vaccine also contains **thiomersal** as preservative (which prevents growth of other microorganisms) and **aluminum hydroxide** as adjuvant (which increases the immunogenicity of vaccine). It is available as liquid form. It is the most **cold sensitive vaccine**, stored in the temperature of 2–8°. If the vaccine exposed to cold and if administered to a child, two hazards may occur. **Adjuvants get separated from vaccine, so there is decreased immunogenicity and there may be sterile abscess formation.** After the cold exposure, vaccine potency can be tested by shake test.

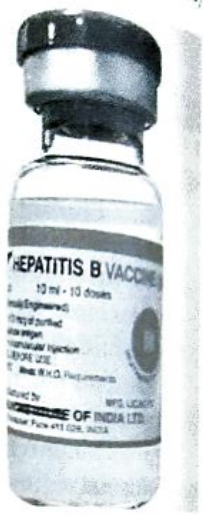

Fig. 10.27: Hepatitis B vaccine

When to give: It is given at birth or as early as possible within 24 hours, subsequently three doses are given at 6, 10 and 14 weeks in combination with DPT and Hib in the form of pentavalent vaccine, this vaccine can be maximally given up to 1 year, infant age group receives high priority.

Route, site and dose: Intramuscular injection is given at anterolateral side of mid-thigh, 0.5 mL.

Indications of the vaccine other than routine immunization: Health care personnel, patients receiving frequent blood products, persons with high risk (sexual) behavior, injectable drug users, travelers to areas endemic to HBV, may be given the vaccine to protect from the infection.

Route, site and dose for adults: It is given IM in deltoid, 1 mL is given at 0, 1, 6 months.

Side effects of the vaccine: Soreness, erythema, induration, fatigue, malaise, etc.

Contraindication: Known hypersensitivity to any component of vaccine or subjects having signs of hypersensitivity after previous hepatitis B vaccine administration. Preterm babies with birth weight <2.0 kg is exempted.

Rapid dose schedule (indications): High-risk individuals like surgeons, dentists, laboratory technicians in blood banks should be protected by three doses. Minimum interval is 4 weeks between first to second dose. Minimum interval between second dose to third dose is 8 weeks. However, first dose and third dose is separated by 16 weeks.

Q97. Explain the rationality of giving hepatitis B vaccine in infants. *(WBUHS, 2007)*

Ans: Hepatitis-B vaccine, now introduced in the National Immunization Schedule, given at birth (within 24 hours) to prevent perinatal transmission and is given at age of 6, 10, 14 weeks (Hep-B_1, Hep-B_2, Hep-B_3) along with DPT and OPV vaccine. The vaccine is administered deep IM in antero-lateral aspect of thigh and dose is 0.5 mL. These three doses are given maximally up to 1 year (Infant age group), because it is a costly vaccine and infant age group receives high priority, because chance of chronicity (like chronic hepatitis, hepatocellular carcinoma, cirrhosis of liver, etc.) of acute hepatitis is very high in this age group which are very dreadful condition and it may result in death. So, if acute hepatitis can be prevented by vaccination in this age group, chance of chronicity can be prevented. So, infant age group receives high priority for hepatitis-B vaccine.

Q98. Write short note on pentavalent vaccine. *(WBUHS, 2018; AKUB, 2022; ABKUB, 2018, 2020; DU, 2013; SSUHSA, 2022)*

Ans: Pentavalent vaccine **(Fig. 10.28)** is a combined vaccine to protect the children from five diseases **Diphtheria, Tetanus, Pertussis, Haemophilus influenzae type B infection and Hepatitis B.**

When to give: It is given at 6, 10 and 14 weeks of age (can be given till 1 year of age).

Route, site and dose: Pentavalent vaccine is given intramuscularly on anterolateral side of mid-thigh and 0.5 mL.

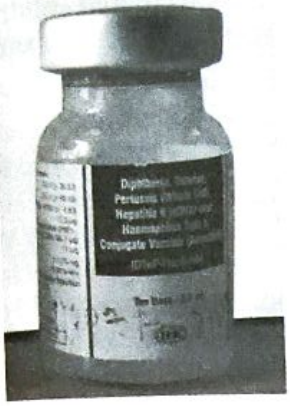

Fig. 10.28: Pentavalent vaccine.

Fig. 10.29: MR vaccine.

Write a brief note about Measles vaccine/Measles vaccine is given at 9 months of age—justify. *(BNMUB, 2005, 2016; RGUHS, 2012, 2015; SSUHSA, 2008, 2010; SMU, 2013; ABKUB, 2023)*

Ans: Measles vaccine: It is a **live-attenuated viral vaccine** containing Edmonston-Zagreb strain and available in freeze dried powder form reconstituted with **pyrogen free double distilled water.** Reconstituted vaccine should be used by 4 hours. Measles vaccine is used to protect children from measles. **MR (Measles and Rubella) (Fig. 10.29)** vaccine introduced in National Immunization Schedule to protect the children from Measles and Rubella.

When to given: First dose of Measles or MR vaccine is given at 9 completed months to 12 months and second dose is given at 16–24 months. If any child came late, then two doses of vaccine can be given at a 1 month interval until 5 years of age.

Route, site and dose: Measles vaccine is given as subcutaneous injection in right upper arm (deltoid) to maintain **uniformity and to help surveyors in verifying the received of the vaccine**, 0.5 mL.

Rationale of administration of Measles vaccine at the age of 9 months:

Ans: The principal problem of measles immunization is timing. **Natural antibodies acquired through mother up to 9 months thus measles vaccine ineffective before 9 months**. Immunization later than 9 months means a significant proportion of children will contract measles in the interval between wearing off natural protection and the introduction of vaccine. So, the first dose of measles vaccine is given at the age of 9 months in the form of Measles containing vaccine (MCV_1). **Now, it is seen that vaccine effectiveness under field condition is 85% when given at 9 months and 95%, when given after 12 months**. If the vaccine coverage is 70% and 85% vaccine effectiveness at 9 months, actual protection is offered to only 60.5 of annual birth cohorts. In other words, at least 40% remained susceptible to measles. **A second opportunity for measles vaccine is given at or above 1 years of age. In states like West Bengal, measles vaccine second dose (MCV_2) is given at the age of 16–24 months along with DPT and OPV booster.**

Adverse effects of vaccine: Toxic shock syndrome (TSS) occurs when measles vaccine is contaminated or the same vial is used for more than one session on the same day or next day. It is characterized by severe watery diarrhea, vomiting, fever, etc. This is totally preventable and reflects poor quality of immunization services.

Epidemiologically measles is eradicable—explain. *(WBUHS, 2016; SSUHSA, 2023)*

Ans: Epidemiologically measles is eradicable due to following reasons:

- It affects human beings only. No other source can transmit the disease.
- No animal reservoir is existent. Virus is present only in human beings.
- Absence of subclinical and carrier state helps detection of cases who may spread the disease. Early action can be taken in this situation.

- Availability of safe effective vaccine will protect almost all the vaccinated children.
- National and International co-operation will act against the disease burden and for vaccination.

All these events suggest that the disease can be eradicated in future.

MR campaign is being implemented to get relief from the incidence of Measles and Rubella. Government of India (GOI) is working for measles elimination in a phased manner. Measles and Rubella elimination goals were set by WHO regions. In order to achieve maximum coverage during the campaign, multiple stakeholders have been involved, which includes, apart from Ministry of Health and Family Welfare, other Ministries, development partners, Lions clubs, professional bodies, for example, Indian Association of Pediatrics, Indian Medical Association, Indian Association of Preventive and Social Medicine, Civil Society Organizations, etc.

All children from 9 months to less than 15 years of age will be given a single shot of Measles-Rubella (MR) vaccination during the campaign. Following the campaign, MR vaccine will become a part of routine immunization and will replace measles vaccine, currently given at 9–12 months and 16–24 months of age of child.

For those children who have already received such vaccination, the campaign dose would provide additional boosting to them.

Q101. Write short notes on MMR vaccine. *(DU, 2014)*

Ans: MMR stands for Measles-Mumps-Rubella. MMR vaccine is a combined vaccine for these three diseases. Existing evidence on the safety and effectiveness of MMR vaccine supports current policies of mass immunization aimed at global measles eradication and in order to reduce morbidity and mortality associated with mumps and rubella considering the prevalence of these diseases.

Children should get two doses of MMR vaccine, usually:

- First dose: 12 through 15 months of age
- Second dose: 4 through 6 years of age

Infants who will be traveling outside the United States when they are between 6 and 11 months of age should get a dose of MMR vaccine before travel. This can provide temporary protection from measles infection, but will not give permanent immunity. The child should still get two doses at the recommended ages for long-lasting protection.

Adults might also need MMR vaccine. Many adults of 18 years of age and older might be susceptible to measles, mumps, and rubella without knowing it.

A third dose of MMR might be recommended in certain mumps outbreak situations.

MMR vaccine has been linked with a very small risk of febrile seizures (seizures or jerking caused by fever). Febrile seizures following MMR are rare and are not associated with any long-term effects. Because the risk of febrile seizures increases as infants get older, it is recommended that they get vaccinated as soon as recommended. Some people may experience swelling in the cheeks or neck. MMR vaccine rarely causes a temporary low platelet count, which can cause a bleeding disorder that usually goes away without treatment and is not life threatening.

Q102. Difference between Chickenpox and Smallpox. *(NU, 2013, 2015, 2016)*

Ans:

Characteristics	*Smallpox*	*Chickenpox*
Incubation period	About 12 days (Range 7–17 days)	About 15 days (Range 7–21 days)
Prodromal symptoms	Severe	Usually mild
Distribution of rash	• Rash is **centrifugal in nature that means away from center** • Palms and soles frequently involved • Axilla usually free • Rash predominantly on **extensor surfaces** and bony prominences	• Rash is **centripetal in nature that means towards center** • Seldom affected • Axilla affected • Rash mostly on **flexor surfaces**

Characteristics	Smallpox	Chickenpox
Characteristics of rash	• Deep-seated • Multilocular; umbilicated • Only one stage of rash may be seen at one time • No area of inflammation is seen around the vesicles	• Superficial • Unilocular; dew drop like appearance • **Rash pleomorphic,** i.e., different stages of the rash evident at one given time, because rash appears in successive crops • An area of inflammation is seen around the vesicles
Evolution of rash	• Evolution of rash is slow, passing through definite stages of macule, papule, vesicle and pustule • Scab begin to form 10–14 days after the rash appears	• Evolution of rash very rapid • Scab begin to form 4–7 days after the rash appears
Fever	It subsides with the appearance of rash but may rise again in the pustular stage (secondary rise of fever)	Temperature rises with each fresh crop of rash

Write a short note on Chickenpox and its prevention. *(WBUHS, 2010; BNMUB, 2011, 2015; TDMGRMU, 2012; RGUHS, 2001)*

Chickenpox is an acute, highly infectious disease caused by varicella-zoster virus. One attack gives durable immunity, second attack is rare. It can occur in any age but maternal antibody protects the infant during first few months of life. It can be severe in normal adult. It shows a seasonal trend with peak incidence during winter and spring.

Chickenpox is transmitted from person-to-person by droplet infection and droplet nuclei. Incubation period is usually 14 to 16 days.

- **Complications:** It is associated with acute retinal necrosis. Secondary bacterial infection includes group β-hemolytic streptococci, cellulitis, osteomyelitis. Pitted scars are frequent sequelae.
- **Management:** Symptomatic treatment is given as there is no treatment along with isolation. Analgesics, antipyretic and anti-allergic can be applied.
- **Vaccine:** A live attenuated varicella-vaccine, freeze dried has been developed by using Oka-strain of the virus in Japan from human diploid cells which is safe and effective. **Diluent is sterile distilled water. It is recommended for the children between 12 months to 12 years but not for infants.** It is given in subcutaneous route, dose 0.5 mL. Immunity last for 5 to 10 years with good efficacy. Indian Academy of Pediatrics recommended second dose during 5 years. For primary immunization in adult, two doses are recommended with 4–8 weeks interval.
- **Passive immunization:** Varicella zoster immunoglobulin (VZIG) was given for those at risk such as young close contacts and effective only when it is given in 3 to 4 days of exposure.

What is 17D vaccine? *(ABKUB, 2018, 2019; RGUHS, 2001; TDMGRMU, 2014)*

Yellow Fever is a disease of African countries. This is not seen in our country. Vector mosquito is highly present here. Absence of Yellow Fever virus saves us. Fortunately vaccine against the disease has been discovered and practiced for protection from Yellow Fever.

Live attenuated and freeze dried (lyophilized) vaccine prepared from a nonvirulent strain named 17D strain which is grown in chick embryos. 17D vaccine **(Fig. 10.30)** is the vaccine used for prophylaxis of Yellow Fever. **Content:** Yellow fever virus stain 17D—not less than 1600 PFU, lactose—20 mg.

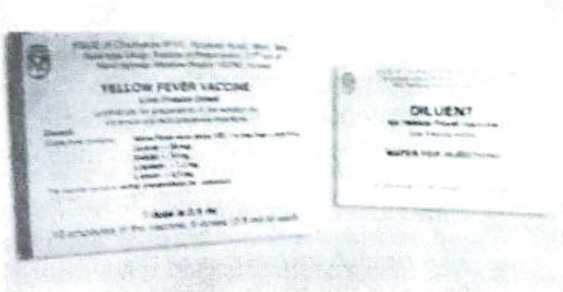

Fig. 10.30: 17D vaccine.

sorbitol—10 mg, L-histidine—12 mg, L-alanine—0.7 mg. **Distilled water used as diluents**. It is stored between +2° and –8°C, preferably below subzero temperature.

Route, site and dose: It is given in subcutaneous route at the insertion of deltoid, single dose of 0.5 ml irrespective of age.

Immunity: Immunity begins to appear within 10 days and 99% are protected within 1 month of vaccination and it appears to be lifelong.

Indication: International travelers, both the groups of persons living in Yellow Fever endemic zone and Yellow fever nonendemic zone.

Contraindication: Pregnancy (if there is no risk of exposure), infants (if there is no risk of exposure).

Q105. Eradication of tetanus is not practicable-comment. *(WBUHS, 2017, 2021; SSUHSA, 2023)*

Ans: Maternal and neonatal tetanus is an important cause of maternal and neonatal mortality particularly in the developing countries like India. Most cases occurs in poor, remote and isolated communities with poor access to healthcare delivery services.

Tetanus is caused by ***Clostridium tetani***, a gram-negative, anaerobic spore bearing organism. The spores are highly resistant to a number of injurious agents, including boiling, phenol, cresol, etc. They germinate under anaerobic conditions and produce a potent exotoxin. They may be destroyed under pressure at 120°C for 20 minutes or by gamma irradiation.

The natural habitat of the organism is soil and dust. The bacilli are found in intestine of many herbivorous animals, e.g., cattle, horses, goats and sheep and are excreted in their feces. The spores are blown about in dust for long period of time and may occur in a wide variety of situations, including operation theatres. The social factors such as unhygienic customs and habits play an important role for the causation of the disease.

Important predisposing factors are:

1. Lack of immunization with TT during pregnancy.
2. Lack of hygienic environment during delivery.
3. Lack of aseptic precautions (5Cs) while conducting delivery.
4. Brutal habits of cutting the umbilical cord with rusted blade or knife, followed by application of cow dung to the umbilical cord to control bleeding.
5. Use dirty cloth to cover the umbilical cord.

Considering all the above facts, technically eradication of tetanus is not practicable due to their omnipresence.

The Ministry of Health and Family Welfare, GOI and WHO, UNICEF and other partners, designed and implemented the following strategies for control of tetanus.

- Acceleration of routine Td immunization coverage in pregnant women and supplemental Td immunization in childbearing age groups of pregnant women in high risk districts.
- Vaccination of pregnant women attending ANC with Td vaccine. Integration of outreached services in VHNDs, engagement of ASHAs.
- Operationalization of selected subcenters and community health centers for 24 × 7 for obstetric and neonatal services for promoting institutional delivery.
- Implementation of JSY scheme.
- Distribution of disposable delivery kits (DDK) to skilled birth attendant, 5 "clean practices."

Q106. Candidate vaccine. *(ARKUH, 2006)*

Ans: The health ministries of the countries and the World Health Organization, etc., help the drug companies to find out the strain of virus or type of bacteria or other microbe that will be the best match for the microbe that they are wanting to protect the public against with a vaccination.

Once the drug companies have grown the virus/bacteria, etc., and then killed or weakened it, so it cannot make anyone sick they put it into a solution for injection.

Once the approval groups within the governments, such as the Food and Drug Administration (FDA) in the US and the European Medicines Agency (EMEA) in Europe/UK, have all the information about the candidate vaccines, they study the documentation and test results and select those candidate vaccines that they approve for use in their countries, and then the chosen vaccines are called approved vaccines instead of **candidate vaccines.**

Describe different phases in clinical trial of vaccines.

Phase of trials	Objectives	Participants
Phase I	Safety and acceptably	Up to 50 Healthy volunteers
Phase II	Long-term safety Early indications of efficacy	100 to 500 Low risk
Phase III	Effectiveness	More than 1,000 High risk
Phase IV	Post marketing surveillance	More than 1,000 Community-based

(RGUHS, 2010)

Influenza vaccine.

There are two types of Influenza vaccines available—killed and live-attenuated vaccines.

1. **Killed vaccines:** Inactivated vaccines are used in most influenza vaccination program. The vaccine is conventionally formulated in aqueous or saline suspension. It can be administered by the subcutaneous or intramuscular route. A single dose is usually given, for adult and 0.5 mL and children over 3 years and for children over 6–36 months 0.25 mL. Children below 9 years of age with no immunological experience, two doses are given with an interval of 4 weeks are necessary to induce antibody level. Annual vaccination is recommended.

   Contraindications: Inactivated vaccines should not be administered in the following condition:
   - People with severe allergy to chicken eggs
   - People with a history of anaphylactic reactions or other life-threatening allergic reactions to any of the constituents of the vaccine.
   - People who developed Guillain-Barre syndrome (GBS) within 6 weeks of getting an influenza vaccine.
   - Children of less than 6 months of age.
   - People who have a moderate to severe illness with a fever.
2. **Live attenuated vaccines:** A trivalent, live-attenuated influenza vaccine administered as a single dose intranasal spray. It can be used in healthy individuals between the age of 2 and 49 years. It will not be given to immune-compromised individuals.

VIVA (ORAL) QUESTIONS

Why conditioning of icepacks are very important issue in case of vaccination?

Ans: When icepacks are removed from a deep freezer, they are normally between –15°C to –25°C temperature. If placed immediately inside a cold box and vaccine carrier, freeze-sensitive vaccines may freeze accidentally. **This ice pack needs to be kept at room temperature to allow the temperature of ice at the core of the icepack to rise to 0°C. This process is called conditioning.** At start of session day, frozen icepacks should be taken out from the deep freezer and closing the door. It should be laid down on a table at the room temperature leaving a 5 cm space all round each icepack till it sweats. **To know whether icepack has reached the stage of conditioning, observe for sweating of icepacks and shake it to listen the crackling sound of water.**

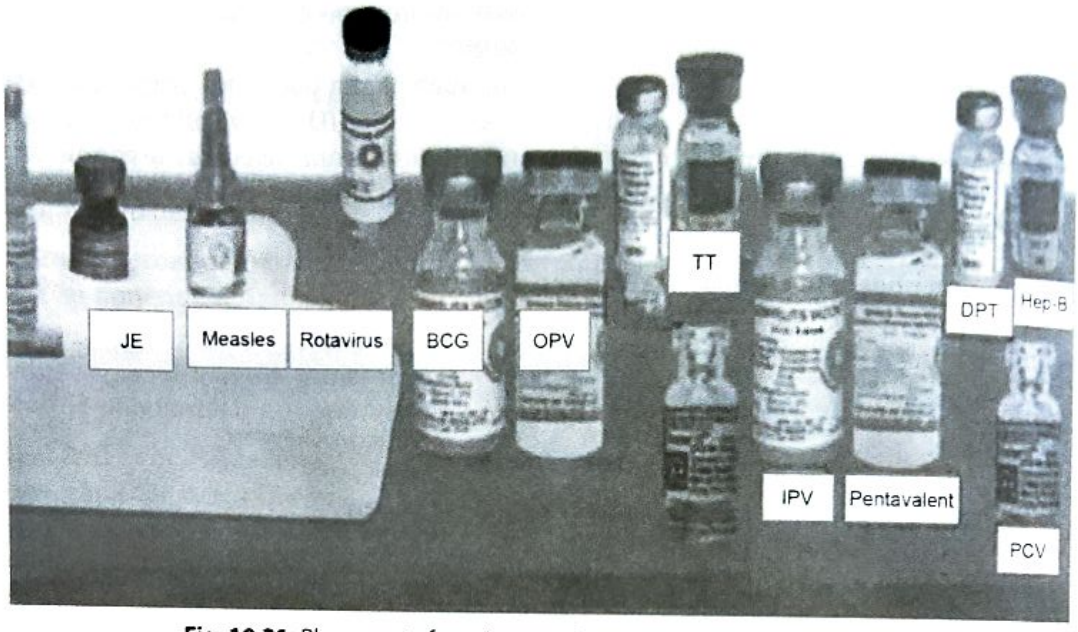

Fig. 10.31: Placement of vaccines on the icepacks and off the icepacks.

Q109b. Vaccines placement on and off the icepack:

Ans: As per the routine immunization guidelines, the health workers should place the BCG and measles vaccine in the wells of the icepack and OPV and JE vaccine in the surface of the icepack whereas IPV, Hep-B, DPT, TT/Td and pentavalent vaccine should never be kept on the surface icepack **(Fig. 10.31)**.

Q109c. Explain—vaccines: Sensitivity to heat and freezing.

Ans: Most freeze-dried vaccine rapidly lost the potency after reconstitution. It is important to keep opened multi-dose vaccine vials that do not contain preservative—whether lyophilized or liquid, cooled at temperature between +2°C to +8°C during the immunization session or used within 4 hours after opening, whichever comes first. Examples of vaccine from most heat sensitive to least heat sensitive are; OPV, influenza vaccine, IPV, JE, Measles, MR, MMR vaccine, *Rotavirus*, Yellow Fever, BCG.

Q109d. Explain why some vaccines are sensitivity to light?

Ans: Some vaccines are very sensitive to light and lose potency when exposed. Those vaccines should always be protected to sunlight and artificial light. Vaccines sensitive to light are BCG, measles, MR, MMR and rubella vaccine. These vaccine are kept in dark glass (Amber color) vials for protection. They should be kept in secondary packing during storage and transport.

Q109e. Why dose of BCG vaccine is 0.05 mL in case of children below 1 month of age?

Ans: As the skin of the neonate is thin and intradermal injection of 0.1 mL may break the skin or penetrate into the deeper tissue and cause local abscess and axillary lymph nodes. So, the dose of 0.05 mL is sufficient to protect the neonates.

Q109f. Why BCG vaccine is given only up to 1 year of age?

Ans: Most children acquire natural clinical/subclinical TB infection by the age of 1 year. So, BCG protects against severe forms of childhood tuberculosis, e.g., TB meningitis and miliary TB.

Q109g. If no scar appears after administration of BCG, is revaccination required?

Ans: There is no need to revaccinate the child, even if there is no scar.

Q109h. Role of OPVO at birth.

Ans: It is called **"zero dose"** because it is given before the recommended first dose and also because it results in the development of gut immunity (sensitization) only and not systemic immunity.

Q109i. Can OPV and vitamin A is given with DPT booster.

Ans: Yes

Q109j. Can an infant be breastfed immediately after OPV.

Ans: Yes

Q109k. Why second dose of measles vaccine is introduced in the National Immunization Programme?

Ans: Measles is highly infectious disease causing illness and death due to complications such as diarrhea, pneumonia or brain infection. If the vaccine given at 9 months it protects 85% protection of the children and the aim of second dose is to protect all the children who remain unprotected after the first dose.

Q109l. What is accelerated measles mortality reduction strategy/Why vitamin A is given along with measles vaccine?

Ans: Vitamin A is effective for treatment of measles hence can reduce morbidity and mortality rate. WHO recommended administration of 2 lakh IU of vitamin A once daily for 2 consecutive days to all children of measles at the age of ≥12 months. Children aged 6–12 months recommended doses 1 lakh IU and children less than 6 months 50,000 IU of vitamin A for 2 consecutive days. A third dose is recommended after 2–4 weeks later for the children with vitamin A deficiency.

Q109m. When measles vaccine is given at 6 months of age?

Ans: During the epidemic of measles or history of contact with case of measles, it can be given as early as 6 months of age, hence those children require a second dose of measles vaccine at the age of 9 months. The gap between the two doses at least 4 weeks. Other vaccine should be given as per national immunization schedule.

Q109n. What is measles catch up campaign?

Ans: Catch up campaign dose is given to all children (both immunized and unimmunized), target age groups are 9 months to 10 years. The goal of a catch up campaign is make the 100% target population immune from measles and also reduce mortality.

Q109o. If a child comes later for first dose, then can it get the second dose?

Ans: As per the National Immunization Schedule all children should be immunized at the right age, i.e., first dose at 9 to 12 months and second dose at 16–24 months. If any child came late, then give two doses of measles vaccine at a 1 month interval until 5 years of age.

Q109p. If a child received one dose of measles vaccine during an SIA campaign, should it receive the routine dose of measles vaccine?

Ans: The child should receive routine doses of measles vaccine according to NIS irrespective of SIA dose of the vaccine.

Q109q. Why DPT vaccine is given in the antero-lateral aspect of mid-thigh and not in the gluteal region?

Ans: DPT vaccine is given in the antero-lateral aspect of mid-thigh and not in the gluteal region to prevent damage to **the sciatic nerve**. The vaccine is deposited in the fat of the gluteal region does not invoke the appropriate immune response.

Q109r. Why a minimum gap of 4 weeks between the two doses of DPT?

Ans: It will take minimum of 4 weeks for the production of antibody after DPT vaccine.

Q109s. If a child could not receive DPT1, 2, 3 and OPV 1, 2, 3 according to NIS, up to what age can the vaccine be given?

Ans: DPT vaccine can be given up to 7 years of age and OPV can ve given up to 5 years of age. If the child has received pervious doses but not completed schedule, do not restart the schedule and should administer the remaining doses as per schedule.

Q109t. Why DT is replaced by DPT vaccine for children above 2 years of age?

Ans: As pertussis cases were reported in higher age group of children and risk of AEFIs were not found to be more after DPT vaccine as compared to DT vaccine.

Q109u. What should be done if a child is found allergic to DPT or develops encephalopathy after DPT?

Ans: A child who is allergic to DPT or develops encephalopathy after DPT should be given the DTaP/DT vaccine instead of DPT for the remaining doses. Usually the pertussis component of the vaccine which causes allergy/ encephalopathy.

Q109v. A child aged 10 months remains unimmunized. Advise immunization of the child till 16 years of age.

Ans: **At 10 months of age**, priority is to give MR_1 **vaccine** with OPV_1 and first dose of vitamin A (1 lakh IU), first dose of **pentavalent vaccine** (instead of DPT_1 and Hep B_1), 0.5 mL, IM in the anterolateral aspect of left mid thigh. **BCG** can be given in left arm, 0.1 mL ID. MR_1 vaccine is given subcutaneously in right upper arm, dose is 0.5 mL and JE_1 subcutaneously in left upper arm, dose is 0.5 mL in the endemic areas.

- **At 11 months:** OPV_2, pentavalent $vaccine_2$ can be given (instead of DPT_2 and Hep B_2)
- **At 12 months:** OPV_3, pentavalent $vaccine_3$ can be given (instead of DPT_3 and Hep B_3)
- **At 16–24 months:** DPT $booster_1$, OPV $booster_1$, MR_2 and JE_2 and vitamin A in oil second dose afterwards, vitamin A is given at 6 months interval total **9 doses up to 5 years.**
- **At 5–6 years:** DPT $booster_2$
- **10–16 years:** Td vaccine

Q109w. Which vaccines can be given to a child between 1–5 years of age, who is unvaccinated?

Ans: The child should be given DPT_1, OPV_1, Measles vaccine and 2 lakh IU of vitamin A solution. DPT and OPV second and third dose should be given at 1 month interval. Measles vaccine second dose should be given as per schedule, i.e., at 16 to 24 months. The booster dose of OPV/DPT can be given at a minimum interval of 6 months of DPT_3/OPV_3.

Q109x. Which vaccines can be given to a child between 5–7 years of age, who is unvaccinated?

Ans: The child should be given DPT_1, DPT_2 and DPT_3 at 1 month interval. The Booster dose of DPT can be given at a minimum of 6 months after the DPT_3 given up to 7 years of age.

Q109y. Should one restart with first dose of a vaccine if the child brought late for the dose or defaulter or left out?

Ans: If the child brought back late or defaulter, vaccination should **not be started from the fresh**. If a child already received BCG, Pentavalent $vaccine_1$, OPV_1 at the age of 6 months and again came at 11 months, vaccinate the child with $Pentavalent_2$, OPV_2, measles vaccine and vitamin A first dose (1 lakh IU) and in 12 months $pentavalent_3$ and OPV_3. JE_1 in the endemic areas. Next vaccine should be given as per schedule.

Why sprit swab not advisable to clean the injection site before vaccination?

Ans: The live components of vaccine is killed if they come and contact with sprit.

If a child above 2 years of age has not received the JE vaccine either routine immunization or SIA should he/she be given the JE vaccine?

Ans: Yes, the child is eligible to receive a dose of JE vaccine, till the age of 15 years.

What is the vaccine for meningococcal meningitis for adults?

Ans: For adults up to 64 years, vaccination with pneumococcal polysaccharide vaccine (PCV23) is done for protection of geriatric population. Then at 65 years and above pneumococcal conjugate vaccine (PCV13) is advocated and after 1 year pneumococcal polysaccharide vaccine (PCV23) is again prescribed. It is given in deltoid muscle, dose 0.5 mL, IM.

ASHAs of a sub-center in X district reported an outbreak of fever with rash cases of under five children in the month of February 2024. HIMS data shows poor immunization coverage in this sub-center for the year 2023 with lot of left out and drop out cases? *(WBUHS, 2024)*

a. What do you mean by an outbreak?

b. What stands for left out and drop out cases?

c. As an administrative officer of district X, how will you investigate this outbreak?

Ans:

a. An outbreak is occurrence of cases of illness or health events clearly in excess of normal expectancy in a community/region in a specified time.

b. Left out: Who have never been vaccinated or reached (thus remaining unvaccinated).
Drop out: Who started vaccination but did not complete the schedule (thus remaining partially immunized).

c. Investigation of outbreak: Answer from Chapter 7, Q7

10.5: Integrated Management of Neonatal and Childhood Illness (IMNCI) and other existing Programs.

IMNCI. *(BNMUB, 2013; ABKUB, 2018; SAMU, 2011; SSUHSA, 2012; BUMP, 2010; DU, 2012; NU, 2015; RUJH, 2010; KIMS, 2019; SDVPG, 2023; GNSUB, 2023; GOAU, 2022; VNSGUS, 2023)*

Ans: **IMNCI (Integrated Management of Neonatal and Childhood Illness):**

Most sick children present with signs and symptoms related to more than one conditions. This overlap means that a single diagnosis may not be possible or appropriate, and that treatment may be complicated by the need to combine therapy for several conditions. Surveys of the management of sick children at these facilities reveal that many children are not properly assessed and treated, so their parents are poorly advised. Providing quality care to sick children in these conditions is a serious challenge. In response to these challenges WHO and UNICEF developed a strategy known as IMCI (1992).

The extent of childhood morbidity and mortality caused by **diarrhea, ARI, malaria, measles and malnutrition** is substantial.

This is cost effective and prevention of disease and promotion of child health as well as provision of standard case management.

The strategy combined improve management of childhood illness with aspects of nutrition, immunization and important disease prevention and health promotion elements. The objectives are to reduce deaths and frequency and severity of illness and disability and to contribute improved growth and development.

The strategy includes three main components:

- Improvement in case management skills of healthcare staff
- Improvement of overall health systems
- Improvements in family and community health practices
- Collaboration with other departments like PRIs, self-help groups and ICDS

First two components are facility-based IMNCI, third and fourth are community-based IMNCI.

In the Indian version of IMCI has been renamed as integrated management of neonatal and childhood illness (IMNCI): In the Indian context this strategy is quite pertinent considering the evidence from NFHS II report revealed that ARI (17%), diarrhea (13%), fever (27%) and under-nutrition (43%) under the age of 5 years. Measles coverage is also low.

The major highlights in Indian adaptation:

- Inclusion of 0–7 days in the program
- Incorporating national guidelines on malaria, anemia, vitamin A supplements and immunization schedule
- Training of health personnel begins with sick young infants up to 2 months
- Equal time devoted for training of personnel for sick infants and sick childs
- Training is skilled based.

The case management process presented on two different set of charts:

1. Children aged 1 week to 2 months
2. Children aged 2 months **(Table 10.2)** to 5 years **(Table 10.3)**

IMNCI guidelines are based on the following principles:

A. Examining all children aged up to 5 years of age for general danger signs and all young infants for signs of very severe disease **(Table 10.4)**. These signs indicate severe illness and the need for immediate referral or admission to hospital.

B. **The children and infants are then assessed for main symptoms:**
   - *In older children the main symptoms include:*
     - Cough or difficulty in breathing
     - Diarrhea
     - Fever and
     - Ear infection
   - *In young infants, the main symptoms include:*
     - Local bacterial infection
     - Diarrhea
     - Jaundice

C. **All sick children are routinely checked for:**
   - Nutritional and immunization status
   - HIV status in high HIV settings
   - Other potential problems

D. Only a limited number of clinical signs are used, selected on the basis of their sensitivity and specificity to detect disease through classification. Further, child's classification based on combination of signs and one or more symptom group rather than a diagnosis. The classification of illness is based on a color-coded triage system:
   - *PINK* indicates urgent hospital referral or admission
   - *YELLOW* indicates initiation of specific outpatient treatment
   - *GREEN* indicates supportive home care

E. IMNCI management procedures use limited number of essential drugs and encourage active participation of caregivers in the treatment of their children

F. Counseling of caregivers is an essential component of IMNCI regarding home care:
   - Appropriate feeding and fluids
   - When to return for follow up

Case management process done through the following steps:

1. **Assess** the young infant or child by asking the common questions, by examining (look, listen and feel)
2. **Classify** child's illness using color-coded triage system
3. **Identify** specific treatment
4. **Provide** practical treatment instructions
5. **Counsel** the mother/caregiver on feeding including assessment of breastfeeding practices
6. **Provide** follow-up care

Table 10.2: Assess and classify the sick young infant up to 2 months.

Ask the mother:
- Is the infant having difficulty in feeding?
- Has the infant had convulsions (fits).

Look, listen and feel: Count the breaths in 1 minute. Repeat the count if more than 60 breaths per minute
- Look for chest in drawing
- Measure axillary temperature
- Look at the umbilicus. Is it red or draining pus?
- Look for skin pustules
- Look at the young infant's movements
- If infant is sleeping, ask the mother to wake him/her
  - Does the infant move on his/her own?
  - If the young infant is not moving, gently stimulate him/her
  - Does the infant not move at all?

CLASSIFY ALL YOUNG INFANTS

Check for very severe disease and local bacterial infection

Signs	Classification	Treatment
Any of the following signs: • Not feeding well or • Convulsions or • Fast breathing (60 breaths per minute or more) or • Severe chest indrawing or • Fever (37.5°C or above) or • Low body temperature (less than 35.5°C) or • Movement only when stimulated or • No movement at all	**Very severe disease (pink)**	• Give first dose of intramuscular antibiotics • Treat to prevent low blood sugar • Refer urgently to hospital • Advise the mother how to keep the infant warm on the way to hospital
• Umbilicus red or draining pus • Skin pustules	**Local bacterial infection (yellow)**	• Give an appropriate oral antibiotic • Teach the mother to treat local infections at home • Advice mother to give home care for the young infant • Follow up in 2 days
None of the signs of very severe disease or local bacterial infection	**Severe disease or local infection unlikely (green)**	Advice mother to give home care

Table 10.3: Assess and classify sick child aged 2 month to 5 years.

Check for general danger signs

Ask:
- Is the child able to drink or breastfeed?
- Does the child vomit everything?
- Has the child had convulsions?
- Does the child have cough or difficult breathing?
- If yes, then ask
- For how long?

Look, listen and feel:
- If the child is lethargic or unconscious
- Is the child convulsing now?
- Count the breaths in one minute
- Look for chest indrawing
- Look and listen for stridor
- Look and listen for wheezing

Check for severe pneumonia and pneumonia

Signs	Classification	Treatment
Any danger signs • Chest indrawing • Wheezing • Stridor in calm child	**Severe pneumonia/ Vere severe disease (Pink)**	• Refer urgently to hospital, start first dose of antibiotic • If referral is not feasible, treat with an antibiotic and follow up closely • Treat for fever and wheezing if present
• Chest indrawing • Fast breathing (age of child/breaths) • **Below 2 months—60 or more breaths per minutes**	**Pneumonia (yellow)**	• Advise mother to give home care • Give an oral antibiotic for 5 days • Treat for fever and wheezing if present

Contd...

Contd...

Signs	Classification	Treatment
• **2 to 12 months—50 or more breaths per minutes** • **12 months to 5 years—40 or more breaths per minutes**		• Advice mother to return with child in two days for reassessment or earlier if the child is getting worse
No signs of pneumonia or very severe disease	**No pneumonia Cough or cold (green)**	• Assess and treat ear problem or sore throat, if present • Assess and treat other problems • Advise mother to give home care • Treat for fever and wheezing if present

Table 10.4: Assess and classify sick child aged 2 month to 5 years.

Does the child have diarrhea?

If yes, ask for:
- For how long?
- Is there blood in stool?

Look and feel:
- Look at the child's general condition. Is the child:
  - Lethargic or unconscious?
  - Restless and irritable?
- Look for sunken eyes
- Offer fluid to the child. Is the child:
  - Not able to drink or drinking poorly
  - Drinking eagerly, thirsty?
- Pinch the skin of the abdomen. Does it go back:
  - Very slowly (longer than 2 seconds)?
  - Slowly

Check for severe and some dehydration

Signs	Classification	Treatment
Two of the following signs: • Lethargic or unconsciousness • Sunken eyes • Not able to drink or drinking poorly • Skin pinch goes back very slowly	**Severe dehydration (pink)**	• If the child has no other severe classification, give fluid for severe dehydration **(Plan C)** • If the child having other severe problem – Refer urgently to hospital with mother giving frequent sips of ORS on the way – Advise the mother to continue breastfeeding • If child is 2 years or older and there is a cholera in that area, give antibiotic for cholera
Two of the following signs: • Restless/irritable • Sunken eyes • Drinks eagerly, thirsty • Skin pinch goes back slowly	**Some dehydration (yellow)**	• Give fluid, zinc supplements and food for some dehydration **(Plan B)** • If the child having other severe problem – Refer urgently to hospital with mother giving frequent sips of ORS on the way – Advise the mother to continue breastfeeding • Advise mother when to return immediately • Follow up in 5 days if not improving
Not enough signs to classify as some or severe dehydration	**No dehydration (green)**	**Give fluid, zinc supplements and food to treat diarrhea at home (Plan A)** • Advise mother when to return immediately • Follow up in 5 days if not improving

Check for persistent diarrhea and dysentery

Signs	Classify	Treatment
If diarrhea 14 days or more, dehydration present	**Severe persistent diarrhea (pink)**	• Treat dehydration before referral unless the child has another severe classification • Referral to hospital

Contd...

Sign	Classify	Treatment
Diarrhea 14 days or more Severe dehydration	**Persistent diarrhea (yellow)**	• Advice mother on feeding a child who has persistent diarrhea • Give multivitamins and minerals including zinc for 14 days • Follow up in 5 days
Blood in stool	**Dysentery (yellow)**	• Give ciprofloxacin for 3 days • Follow up in 5 days

For assessment of sick infant up to 2 months same type of flowcharts are used to check jaundice, diarrhea and feeding problem or low birth weight baby.

For assessment of child aged 2 months to 5 years same type of flowcharts are used to check fever, ear problem, malnutrition, anemia.

(ABKUB. 2023)

F-IMNCI.

Ans It is integration of facility-based care package with IMNCI package in order to empower health personnel with skills to manage newborn and childhood illness at the community level as well as the facility. It focuses on providing appropriate inpatient management of major causes of neonatal and childhood mortality, e.g., asphyxia, sepsis, LBW in neonates and pneumonia, diarrhea, malaria, meningitis and severe malnutrition in children.

(BUMP. 2008)

Describe the problem of ARI.

A 6-month-old infant with ARI had a respiratory rate 56/minute. There was no chest indrawing and no danger sign. Classify the ARI with justification and discuss the management accordingly.

(WBUHS. 2007)

(BUMP. 2008)

How do you treat ARI of under 5 children.

Ans The problem of ARI:

Definition of ARI: Acute respiratory infections (ARI) is an acute infection of any part of the respiratory tract and related structures including paranasal sinuses, middle ear and the pleural cavity. It includes all infections of less than 30 days duration except those of the middle ear where the duration of an acute episode is less than 14 days.

Every year an estimated 3.9 million deaths of young children worldwide due to ARI. About 90% of ARI deaths are due to pneumonia which is usually bacterial in origin. While the incidence of pneumonia in developed countries may be as low as 3–4% and that of 20–30% in developing countries, difference is due to high prevalence of malnutrition, low birth weight and indoor air pollution in developing countries.

On an average, children below 5 years of age suffer about 5 episodes of ARI per child per year, thus accounting for about 238 million attacks. Consequently, although most of the attacks are mild and self-limiting episodes, ARI is responsible for about 30–50% of visits to health facilities and for about 20–40% of admissions to hospitals. It is also a leading cause of disabilities including deafness as a sequelae of otitis media.

Pneumonia kills more children than any other disease (more than AIDS, malaria and measles combined). About 0.92 million under 5 years of age children died from pneumonia in 2015, accounting for almost 16% under-five deaths worldwide. ***Streptococcus pneumonia*** is a major cause of illness and death in children, as well as in adults. According to a WHO estimate, about 1.6 million cases of fatal pneumococcal disease occur worldwide, mostly in infants and elderly. Children who are poor, undernourished in remote areas are more likely to suffer from pneumonia. *Haemophilus influenzae* type B (Hib) bacteria is estimated to cause 3 million cases of severe pneumonia and meningitis, and approximately 386,000 deaths per year in children under 5 years of age.

In India, in the States and Districts with high infant and child mortality rates, ARI is one of the major causes of death. ARI is also one of the major reasons for which children are brought to the health facilities. As per hospitals records from states showed that up to 13% of inpatient deaths in pediatric wards are due to

ARI which subsequently increases high infant mortality rates. The reason for high case fatality may be that children are either not brought to the hospitals or brought too late.

In India, during the year 2017, about 40.742 million cases of ARI were reported. During 2017 about 3,86 people died of ARI and 3,281 died of pneumonia. Pneumonia was responsible for about 18% of all "under years" deaths in India.

Assessment and classification the sick children aged 6 months (according to IMNCI)

1. **Ask the mother**—about what the child's problem-cough and its duration, fast breathing, difficult breathing, presence or absence of unable to drink/breastfed, vomiting, convulsion, etc.
2. **Look**—count the breath in 1 minute and chest indrawing, presence or absence of lethargic or unconscious

Classification of pneumonia in respect to fast breathing child aged less than 2 months to 5 years

Age of the child	*Breaths per minute*
Less than 2 months	60 or more
2 months to 12 months	50 or more
12 months to 5 years	60 or more

3. **Look and listen for stridor**

Classification for 6 months child

Signs	*Classify as*	*Color*
Any general danger signs/chest indrawing/stridor in calm child	Severe pneumonia	Pink
Fast breathing (50 or more)	Pneumonia	Yellow
No fast breathing or chest indrawing	No pneumonia: Cough or cold	Green

According to this classification, this infant is suffering from pneumonia, as the infant has first breathing but child has no chest indrawing.

Management:

A. **Antibiotics:** These cases require oral antibiotics and can be treated as outpatients. Drug of choice is cotrimoxazole. It is as effective as ampicillin or penicillin with high cure rates and few side effects and less expensive. This can be used by the health worker safely in the field and by the mothers at home. Cotrimoxazole is available in both pediatric tablets and syrup.

Age/Weight	*Pediatric tablet contains Sulfamethoxazole (100 mg) Trimethoprim (20 mg)*	*Pediatric syrup, each spoon (5 mL) contains Sulfamethoxazole (200 mg) Trimethoprim (40 mg)*
Less than 2 months (3–5 kg)	One tablet twice daily	Half spoon (2.5 mL) twice daily
2–12 months (6–9 kg)	Two tablet twice daily	One spoon (5 mL) twice daily
12 months–5 years (10–19 kg)	Three tablet twice daily	One and half spoon (7.5 mL) twice daily

Dosage schedule: Cotrimoxazole tablet, two tab twice daily or Syrup Cotrimoxazole 1 TSF twice daily for 5 days for 2–12 months.

B. **Homemade remedies** for soothing the throat and relieve cough such as **lime, honey, ginger, Tulsi and worm water can be used.** It is not advised to infants under 2 months.

C. **If nose is blocked** and interferes with feeding or breathing, the mucous can be cleaned by using saline drops or moist wick. Medicated nasal drops should not be used as these can be harmful.

D. **Treat fever**, if present with oral paracetamol tablet or paracetamol syrup.

E. **Advise mother when to return:** Mother is advised to bring her child after 2 days and mother is adequately explained about danger signs, when mother should bring her child also immediately. Danger signals are

- Breastfeeding or drinking poorly
- Becoming sicker
- Feels hot or cold to touch

- Fast breathing
- Difficult breathing

F. **Follow up after 2 days:** Reassessment of children is done after 2 days. If there is improvement, co-trimoxazole tablet is continued for 3 more days. If there is neither improvement nor worsening of the condition, change the antibiotic (oral Amoxicillin, etc.) and reassessed after 48 hours. If there is worsening of the condition, child is referred for hospitalization for treatment with parenteral regimen.

G. **Advice for feeding of infant:** One of the wrong practice of home management of ARI is giving decreased amount of food to the infant, which predisposes undernutrition. Mother is advised to provide normal amount of low cost, locally available energy dense food to her baby during the illness and increase the amount of feeding soon after recovery from the disease for catch up growth.

H. **Advice for future occurrence/prevention of pneumonia:**

- *Appropriate feeding practices:* According to Infant and Young Child Feeding (IYCF) guideline, child should be given breastfeeding and nutritionally adequate, age appropriate, safe complementary feeding with maintaining minimum meal frequency and minimum dietary diversity.
- *Minimum meal frequency:* If the child is breastfed, one katori (average 150 gram) of food is offered for three times daily.
- *Minimum dietary diversity:* Among the seven types of food, four types of food should be offered to the child in each day
  - Cereals and nuts
  - Root, grain, tubers
  - Egg
  - Dairy products
  - Flesh foods
  - Vitamin A rich fruits and vegetables
  - Other fruits and vegetables
- **Improvement in the living condition:** Avoidance of overcrowding and keeping the infant in a well-ventilated room.
- **Reduction of parental smoking and smoke pollution:** Keeping the infant away from smoke, if coal is used as a fuel for cooking. Family members should not smoke close to the child, because passive smoking increases the chance of ARI.
- **Prevention of hypothermia:** Infant should be covered with adequate clothing and extra layer of cloth is used in winter season. Head of the infant must be adequately covered.
- **Personal hygiene:** Hand washing of the mother or other care giver should be done before and after feeding the child, before cleaning the child, etc., infant should be handled by minimum number of persons.
- **Immunization:** Mother should bring the child at immunization clinic at the age of 9 months for measles vaccine and vitamin-A first dose. It is very useful strategy for prevention of ARI.
- **Growth monitoring:** Mother should visit the AWC regularly for growth monitoring at monthly interval.
- **Health education:** About prevention, home management of ARI, importance of appropriate feeding practice, immunization, growth monitoring, etc.

CM10.7: Enumerate and describe the basis and principles of the Family Welfare Program including the organization, technical and operational aspects.

India launched National Family Planning Programme (NFPP) in 1952 and was the first country in the world to do so.

Objectives of NFPP:

- To reduce the birth rate to the extent necessary—21 per thousand population and to achieve total fertility rate of 2.1.

- To stabilize population at a level consistent with the requirement of national economy and development by 2045.
- To reduce maternal and infant mortality and improve quality of life.

Following the historic launch of NFPP, it has undergone a paradigm shift and emerged as one of the key intervention/strategies to reduce maternal mortality, infant mortality and morbidity. It was observed that states having high contraceptive prevalence rates have low maternal and infant mortality rates.

Organization, technical and operational aspects:

A. **Family/Household and community level contraceptive services by ASHAs and AWWs:**
   - *Scheme for delivery of contraceptives by ASHAs at doorstep of beneficiaries:* ASHAs are delivering contraceptives to the target couples in their doorsteps with a nominal price, i.e., ₹ 1 for a pack of 3 condoms, ₹ 1 for a cycle of oral pills and ₹ 2 for a pack of one tablet of emergency contraceptive pill. This is being done by ANMs and AWWs where ASHAs are not available.
   - *Scheme for ensuring spacing at birth:* Under the scheme, the services of ASHAs are utilized for counseling newly married couples to delay 1st childbirth by 2 years after marriage and couples with one child to have spacing of 3 years after birth of first child. ASHAs are given an incentive of ₹ 500 for spacing and ₹ 1,000 for sterilization of couple after 2 children.
   - *Postpartum family planning:* GOI is focusing on strengthening of strengthening postpartum family planning services. Insertion of postpartum IUCD and terminal methods are being promoted under NFPP as 80% of deliveries are institutional.
   - *Home-based pregnancy testing kits:* Pregnancy testing kits (PTK) can detect pregnancy as early as 1 week after missed period providing an early opportunity for medical termination of pregnancy and thus saving lives lost due to unsafe abortions. PTKs have been made available to ASHAs and ANMs at Subcenters.

B. **Fixed day service (FDS):** FDS at health and wellness centers for spacing methods (at sub-centers and PHCs) at least 2 days in a week on a regular basis.

C. **Fixed day service for sterilization and referrals:** At district level–twice in a week, once at week at sub-district hospital, once a fortnight at CHC/FRU and once a month at PHC on a regular basis.

Other services:

- **Alternate method of training in IUCD:** ZOE gynecologic simulator pelvic model is used for demonstration and practice of IUD insertion and removal by health professionals. It is a full-size model of adult female with lower abdomen and pelvis which incorporate adult learning principles and hands-on training.
- **Revised compensation scheme for acceptors of sterilization:** To compensate the acceptors of sterilization for the loss of wages for the day—an amount of ₹ 2,000 for vasectomy and ₹ 1,400 for tubectomy in high focus states is being provided.
- **National family planning indemnity scheme (NFPIS):** In the event of death/failure/complications/ indemnity cover to doctor/health facility and to acceptors of sterilization services has been made available in every state.
- **Appointment of dedicated counselors at high case load health centers:** Under RMNCH+A, counselors are appointed at all high case load facilities to provide counseling services to promote family planning, early initiation of breastfeeding, immunization and child nutrition.
- **Assisted reproductive techniques (ART) for infertility:** About 10–15% of infertile couples of India need ART including in vitro fertilization (IVF).

CM10.8: Describe the physiology, problems, clinical management and principles of adolescent health.

Q113. What are the problems of adolescents? Mention the national programs concerning improvement of adolescent health. *(WBUHS, 2014, 2023; NU 2016)*

Ans: WHO has defined adolescents as persons in the 10–19 years of age group, while youth has been defined as the 15–24 years age group. Young people is a combination of these two overlapping groups covering the range of 10–24 years.

Physiology: Girls begin to show pubertal changes earlier than boys. Reproductive organs start maturing during puberty, human beings are able to reproduce after puberty. At puberty, the girls begin to ovulate and menstruate and boys begin to produce sperms and ejaculate.

In boys, testosterone hormone is responsible for hair growth on pubis and face, deep voice, growth of penis and testes and production of semen. In girls, estrogen hormone is responsible development of breasts, pubic hair, rounding of hips and menstruation.

Problems of adolescents and remedial measures.

Problems of adolescents and their clinical management (remedial measures) are discussed below:

A. **Health problems:**

- *Nutritional problem: It may present as under-nutrition, anemia and obesity:* Overall, 24% of adolescents were thin for their age with BMI less than -2 SD and 5% were overweight or obese BMI +1 SD and about 54% were anemic as per **Comprehensive National Nutrition Survey (CNNS) (2016–18)**. Poor nutrition is cited as an important cause of delay in onset of puberty. Due to poor dietary intakes, discrimination of girl child, tend to develop as short-statured females with low body weights and produce low-birth-weight babies. Obesity is an emerging problem in the adolescent in urban areas.
  Remedial measures: Adolescent should be advised to take nutritious diet easily available low-cost diet for their growth and development and whenever they have manifestation of any disease they must consult doctor.
- *Oral health problems:* Dental caries due to cariogenic foods, funk foods and unhealthy lifestyles.
  Remedial measures: Consult with dental surgeon al least once in a year or any acute problem.
- *Noncommunicable diseases:* Obesity is an emerging problem in adolescents because of unhealthy food habit like eating junk foods, fast-foods and physical inactivity. One-fifth (20%) of Indian children above the age of 8 years are obese and over-weight as per new national survey on physical fitness. One in ten adolescents and young adults in Delhi is clinically obese, 5% have high BP because about 80% of them were physically inactive.
  Remedial measures: Regular check-up al least once in a year through school health services.

B. **Behavioral problems:**

- *Risk behavior:* A significant number of adolescents are engaged in high-risk behavior that results in increase morbidity and mortality. A large number of school adolescents get exposed sexual intercourse mostly unprotected sex.
- *Substance abuse and mental health:* Significant proportion of adolescents have behavioral problems like suicidal tendencies, anxiety, indulging in crime and violence, sexual abuse, premarital sex, exposed to use of tobacco, alcohol and drugs under the influence of peer pressure.
  Remedial measures: Self-awareness, critical thinking, decision-making, effective communication, coping with stress are some of the life skills required to remain away from drugs, alcohol and tobacco.
- *Injuries and violence:* Unintentional injuries like accidents, spot injuries and intentional injuries like suicide and homicides are very common causes of adolescent morbidity and mortality. Adolescents are very pronged to road traffic accidents due to high-speed driving and driving without license, non-use of helmets, violation of safety rules and often under the influence of alcohol. They also engaged in violence and some of them carry knife, rods and chain.
  Remedial measures: Life skills are important vehicles for health and mental promotion and lay foundation for good health and mental well-being of adolescents.
- *Unwanted pregnancies/Teenage pregnancies and illegal abortions:*
  - Teenage pregnancies: It may be unwanted or may occur in unmarried girls hence, illegal abortions are sought which may be life-threating.
  - Sepsis: Infection following illegal abortion is common and it causes sepsis

  Remedial measures: Pregnancies are high in number and associated with illegal abortion. Comprehensive abortion care services should be provided mostly through Anwesha clinics as well as private health facilities.

STIs and HIV/AIDS: On account of early initiation of sexual activity (premarital sex) without use of condoms the adolescents are exposed to the risk of acquiring and transmission of STIs including HIV/AIDS. High prevalence of sexual intercourse in adolescents is associated with high-risk of sexually transmitted diseases and HIV/AIDS because of unprotected sex. Majority of adolescents had not ever heard of STIs. Sexual abuse of boys and girls like rape, trafficking for prostitution and homosexuality are quite frequent.
Remedial measures: The prime need is to correct and complete information on safe sex, contraception, sexuality and STIs/HIV/AIDS and through counseling at schools and ICTC and in Anwesha clinic at block level and use of syndromic management protocol.

C. **Physiological problem:**
- *Irregular menstrual cycles:* Irregular bleeding is sometimes seen after menarche
- *Acne vulgaris:* Common skin problems in adolescents.

Remedial measures: Counseling and seek medical advice.

D. **Social problems:**
- *Early marriages:* About 23.3% of girls get married below the legal age of marriage (18 years) when their pelvises are small, uterus and cervix is immature along with less body weight. These girls enter into early reproduction, outcome in terms of low-birth-weight babies or these teenagers may seek illegal abortions. About 6.8% of total pregnancies are teenage pregnancies. Adolescent fertility rates (AFR) i.e. number of birth per 1000 women aged 15–19 is 43 which is highest in India **(NFHS-5)**.
- *School drop-out:* Many of the girls and boys are dropouts from schools and only one-third continue up to Madhyamik and beyond due to economic constraints.
- *Suicides:* About 35% cases in India
- *Vehicular accident:*
- *Drowning:* About 40.6% in India

Principles of adolescent health: Knowledge and information of adolescents tend to be poor on several issues on health like menstruation and its hygiene, right age of marriage, reproduction, nutrition, growth and development, puberty, safe sex, contraception, sexuality and STI/RTIs as well as HIV/AIDS, prevention of accidents and injuries and promotion of mental health.

Moreover, they tend to collect half-backed knowledge from their peers, which is seldom factual or scientific.

National programs concerning improvement of adolescent health: The adolescent health initiative (AHI) consists of two components:

1. **Adolescent friendly health services (AFHS)**
2. **Adolescent health counseling services:** Adolescent health team consisting of representatives from health, education, welfare, ICDS, IAP, FOGSI and NGOs sees the health of adolescent. Adolescent health clinic in blocks is run for adolescent and if required they are referred to higher health facility.

Other Programs:
- **Mid-day meal program:** It has proven to improve school enrolment, retention in schools and level of learning achieved. It is also one of the important sources of access of the balanced diet for the poor child.
- **National iron plus initiative:** Weekly Iron and Folic acid supplementation Programme (WIFS) in school is observed in school adolescent girls and boys.
- **Kishori Shakti Yojana** is being implemented using the infrastructure of ICDS. The scheme targeted the adolescent girls at the age of 11–18 years and address theirs needs of self development, nutrition and health status, literacy and numerical skills and vocational skills, etc.
- **Nutritional program for adolescent girls:** Undernourished adolescent girls in the age group of 11 to 19 years (with the body weight less than 30 kg in 11 to 15 years and 35 kg in the age group of 15 to 19 years) are covered under the scheme. 6 kg of free food grain is provided to each beneficiary per month implemented through ICDS scheme. Two more schemes are being implemented at ICDS level.
  1. *Sabla:* To improve nutritional and health status
  2. *Indira Gandhi Matritva Sahyog Yojana (IGMSY):* Under which conditional cash transfer to adolescent pregnant and lactating mother in order improve their nutritional and health status.

Describe Rashtriya Kishor Swasthya Karyakram including ARSH.

Ministry of Youth Affairs and Sports **(MOYAS)** launched Rashtriya Kishor Swasthya Karyakram **(RKSK)** in 2014 for adolescents. It is nothing but expanded form of Adolescent Reproductive and Sexual Health **(ARSH).** RKSK strategy focuses on universal coverage of all adolescents, i.e., male and female, urban and rural, married and unmarried, in schools and out of schools, vulnerable and underserved. **RKSK is having 7 (7C) components like:**

- Coverage
- Content
- Communities
- Clinics
- Counseling
- Communication
- Convergence

Major seven strategic priorities are:

1. Nutrition
2. Adolescent reproductive and sexual health
3. Noncommunicable diseases
4. Prevention of substance abuse
5. Prevention of injuries and gender violence
6. Enhance mental health
7. School dropouts

Key interventions:

A. **Community-based interventions:**

- *Peer education (PE):* PE program aims to ensure that adolescents benefit from regular and sustained peer education covering nutrition, reproductive and sexual health, risk factors for noncommunicable diseases, substance abuse, injuries and violence and mental health. This is expected to improve life skills and knowledge of the adolescents.
- *Adolescent Health Day (AHD):* AHD is to be organized in every village/ward once in every quarter on a convenient day (preferably on Sunday) following the Village Health and Nutrition Day **(VHND).** In **SABLA districts,** this day **should coincide with existing Kishori Diwas.** Adolescents, schoolteachers, parents and members of PRI, ASHAs, AWWs, MO in-charge are participate in the meetings.
- *Weekly Iron Folic Acid Supplementation (WIFS):* Program covers adolescents enrolled in class VI to XII of government, government aided and municipal schools as well as out of schools **girls.** It covers:
  - Weekly IFA supplementation (60 mg elemental iron and 500 µg folic acid) in supervised dose
  - Screening of moderate and severe anemia in adolescents with quick referral
  - Biannual deworming with Albendazole 400 mg
  - Advice on dietary intake of iron rich food items.
- *Promotion of menstrual hygiene:* The scheme aims to increase awareness among adolescent girls on menstrual hygiene, increase access to and use of quality sanitary napkins to adolescent girls in rural areas in rural areas and ensure safe disposal of sanitary napkins in an environment friendly manner.

B. **Facility-based interventions:**

- *Adolescent friendly health clinics (AFHCs):* The aim of AFHCs is to provide information, clinical and counseling services to adolescents through existing health system.
- *Level I:* Subcenter: Walk in services at subcenter by multipurpose health workers like promotive, preventive and curative services-screening of anemia, obesity, measurement of blood pressure, distribution of IFA tablets, albendazole, contraceptives and sanitary napkins.
- *Level II:* Primary health center: Weekly dedicated AFHC by Medical Officer, ANMs and counselor.
- *Level III:* Daily AFHC at CHC/Sub-district Hospital/District Hospital/Medical College by Specialists/MO/Counselor/Staff nurse and other additional male and female staff.

C. **Intersectoral coordination/convergence:**
- *Coordination* with health and family welfare-RCH, Rashtriya Bal Swasthya Karyakram, National Tobacco Control, Noncommunicable diseases, National HIV/AIDS Control Programme.
- *Convergence with other departments and schemes:* Women and child development (ICDS), Kishori Shakti Yojana, HRD, Mid-day Meals and Youth Affairs and Sports.

D. **Communication strategy:** National communication strategy for adolescents in collaboration with **UNICEF**. The key strategy for behavior change are intersectoral communication, advocacy through mass media, involvement of NGOs and private sectors, capacity building at all levels as well as IEC at all levels in states and district level. To provide health communication regarding knowledge and awareness on reproductive health issues and delayed marriage.

E. **School-based interventions:** School-based health promotion activities have been incorporated as part of health and wellness component of Ayushman Bharat Programme. The major component is health check-up, T dap/Td at the age of 10 and 16 years to prevent Tetanus, Pertussis, Diphtheria. Immunization for Hepatitis B and Rubella/Measles if not received in childhood. Other optional vaccine like Typhoid, JE in endemic areas and HPV for girls. One day dedicated like Tuesday may be dedicated as health and wellness day in school. Most of the information on health, nutrition and reproduction is in-built in the school curriculum.

NACP has launched massive adolescent health education program on life skills covering high schools. NACP in India has produced a training package titled **"AIDS Education in School"**.

CM10.9: Describe and discuss gender issues and women empowerment.

Gender is socially constructed by roles and responsibilities, attributes, behavior and values, assigned to woman and man, boy and girl in a given culture and location by society. Gender is variable, can change from time-to-time and culture-to-culture. The way boys and girls socialize to be masculine or feminine is called gendering. Patriarchal (male dominance) and wide.

Spread discriminatory practices in the community like "**Son Syndrome**"—son preference, birth of girl child is not wanted, sex selective abortions, female infanticide, differential feeding practices, health seeking behavior, depriving education to girls, getting them married at an early age, uneven distribution of food in the family.

"Sex" is determined biologically and sex identifies the biological differences between women and men. is genetically determined. Female have two X chromosomes and males have one X and one Y chromosome. Therefore, **spermatozoon is sex determinant but not the ovum.**

Women empowerment:
- The 9th plan clearly stated the "Women's Component Plan"—30% of funds were sought to be earmarked for women related sectors. The performance of different health program will be judged on the basis of gender disaggregated data. All reports of PHC and ICDS must be gender-wise (morbidity, mortality, nutrition and services used).
- The 73rd and 74th constitutional amendment acts were passed in December 1992 and became law in April 1993. They provide for direct election of all seats of Panchayats and Nagar Palikas at Village, Block and Zilla Parishad as well as the ward, town and city levels. Not less than one-third of total seats and the offices of chairpersons at each level will be reserved for women. Thus, women has been mainstreamed politically for decision-making.

Economic empowerment of women:
- About 70% of population living below poverty line and very often in extreme poverty. Women's control over economic resources is far less than that of men. About 40% benefits under **Swarnjayanti Gram Swarozgar Yojana (SGSY)** have been earmarked for women. Development of women and children in rural areas (DWCRA) has been merged under SGSY.
- Women's training in agriculture sector like fisheries, poultry, animal husbandry and horticulture has been undertaken on priority basis in proportion to their numbers. Innumerable income generation activities have been launched by the government to improve the economic status of women in organized sector.
- About 53% of women have Savings Bank Account and 45% have mobile phones.

Social empowerment of women: Health sector has implemented National Health Policy (1983), also revised in 2002 and 2017, National Population Policy (2000) and National Nutrition Policy (1993) to reduce the infant and maternal mortality to address gender issues in health. PNDT (Prenatal Diagnostic Techniques Act, 1994) has been enforced to prevent sex selective abortions and improve sex ratio at birth.

Education and empowerment:

- **"Education as the fundamental right"** (in April 2010) reflects the Government's concern and commitment to ensure the right of children of 6–14 years to free and compulsory elementary education to fulfil the constitutional commitment of education for all. **Sarva Shiksha Abhiyan (SSA)** launched in 2001, main focus is being made to reach the unreached women and girl child. Easy and equal access to all women and girls for education through enabling environment to meet the goal of "education for all" in a progressive step.
- Special incentives have been provided to increase the enrolment and retention of girls children in schools through free textbooks, scholarships, free supply of uniforms, mid-day meals, flexible school timings with attached hostels. Lifelong learning through corresponding courses, distance learning for girls who drop out from formal system of schooling.

Role of media: Massive awareness and education on gender issues can be addressed through mass media. Promote gender sensitization of teachers and appointment of more women teachers at primary level and lady doctors at PHCs.

Environmental conservation: Women have been involved in conservation and restoration of environment and control of environmental degradation. Effective use of nonconventional energy sources like solar energy, biogas, smokeless challah and other rural applications to preserve the environment.

Legislative support for women: Many legislative support measures for women like Immoral Traffic Prevention Act, 1956, Dowry Prohibition Act, 1961, Commission of Sati Prevention Act, 1987 and Triple Talaq Act, 2019 has been passed for women.

MULTIPLE CHOICE QUESTIONS (MCQs)

REPRODUCTIVE AND CHILD HEALTH (RCH):

1. **The minimum number of ANC visits/check-ups required for a pregnant woman is:** *(ABKUB, 2021)*
   a. 3 b. 4 c. 6 d. 8

2. **Total no. of postnatal care visit in case of low birth weight baby is:**
   a. 4 b. 5 c. 6 d. 7

3. **In India, women of childbearing (15–44 years) age group constitute:** *(ABKUB, 2017)*
   a. 10% b. 15% c. 22% d. 35%

4. **The most sensitive indicator of MCH services is:** *(ABKUB, 2015)*
   a. Infant mortality rate b. Perinatal mortality rate
   c. Maternal mortality ratio d. Life expectancy at birth

5. **The commonest cause of MMR is:** *(ABKUB, 2019; DBRAUA, 2024)*
   a. Sepsis b. Hemorrhage c. Obstructed labor d. Toxemia

6. **Denominator for maternal mortality ratio is:** *(GITAMAP, 2023)*
   a. Total number of live births b. Total number of deaths
   c. Per 100000 women of reproductive age d. Mid-year population

7. **The most important cause of maternal mortality in India is:** *(SAMU, 2016; YSRUHSAP, 2023; MGUB, 2023, 2024)*
   a. Abortion b. Obstructed labor
   c. Hypertensive disorders d. Hemorrhage
   e. Sepsis/Toxemia

8. LAQSHYA Program was introduced to improve: *(YSRUHSAP 2022)*
a. Quality of care in primary health center
b. Quality of care in community health center
c. Quality of care in labor room and maternity operation theaters
d. Quality of care in district hospitals

9. Anemia is considered a/an _____ cause of maternal mortality: *(ABKUB, 2019; MGUB 2023, 2024)*
a. Direct b. Indirect c. Obstetric d. Nonobstetric

10. LBW, in general, means when birth weight is: *(BNMUB, 2003; SSUHSA 2022)*
a. Less than 1.8 kg b. Less than 2 kg c. Less than 2.5 kg d. Less than 2.8 kg

11. Average weight gain during pregnancy in poor Indian women is about: *(AFUH, 2022; ABKUB 2019)*
a. 12 kg b. 10 kg c. 6.5 kg d. 2.5 kg

12. The extra energy allowance needed during pregnancy is: *(TRIU, 2023; RUJH 2024)*
a. 150 kcal b. 200 kcal c. 350 kcal d. 550 kcal

13. Under MCH Programme, iron and folic acid tablets to be given daily to mother have: *(TRIU, 2023; AHUH 2022)*
a. 60 mg iron + 500 µg folic b. 100 mg iron + 500 µg folic acid
c. 60 mg iron + 100 µg folic acid d. 100 mg iron + 100 µg folic acid

14. Extra energy requirement (kcal) in early lactation is: *(ABKUB, 2018; TRIU, 2023; AKUB 2023)*
a. 300 b. 400 c. 550 d. 850

15. Requirement of extra calories (kcal/day) for a lactating mother during first six months is: *(ABKUB 2020)*
a. 300 b. 450 c. 550 d. 650

16. Calcium requirement in lactating mother in mg/day: *(AKUB 2022)*
a. 600 b. 800 c. 1000 d. 1200

17. Which of the following is true about Janani Suraksha Yojana? *(ABKUB 2020)*
a. It is under the state government
b. No monetary benefit is provided to pregnant mother
c. It is 100% centrally sponsored scheme
d. It does not subsidize the cost of C-section or management of obstetric complications

18. WHO recommended a minimum number of _____ antenatal visits. *(MGUB, 2023, 2024)*
a. 2 b. 4 c. 6 d. 8

19. Infant mortality does not include: *(ABKUB, 2015; TRIU, 2023; GNSUB 2023)*
a. Early neonatal mortality b. Perinatal mortality
c. Postneonatal mortality d. Late neonatal mortality

20. Infant mortality rate is a number of infant death per: *(ABKUB, 2017; AFUH 2022)*
a. 1000 total births b. 1000 live births c. 1000 pregnancy d. None of the above

21. Numerator for infant mortality rate is: *(GITAMAP 2023)*
a. Number of death of children less than 4 years of age
b. Number of death of children less than 3 years of age
c. Number of death of children less than 2 years of age
d. Number of death of children less than 1 years of age

22. Child survival index is 1000—(minus)/10 _____ *(GITAMAP 2023)*
a. Under 5 mortality rate b. Maternal mortality ratio
c. Maternal mortality rate d. Perinatal deaths only

per WHO, low birth weight is: *(AFUH, 2022)*
Birth weight less than 2.5 kg
Gestational age <34 weeks
b. Birth weight <10th percentile
d. Gestational age <28 weeks

ocial smile in a child is observed at: *(YSRUHSAP, 2023)*
6–8 weeks
b. 3 months
c. 4–5 months
d. 6–8 months

Patient treated at home is allotted what color code according to IMNCI color coding? *(ABKUB, 2020)*
Pink
b. Red
c. Green
d. Yellow

Five cleans practices' under strategies for elimination of neonatal tetanus include all of the following except: *(ABKUB, 2015)*
Clean surface for delivery
New blade for cutting the cord
b. Clean hand of the attendant
d. Clean airway

Which of the following is the correct recommendation for breastfeeding? *(ABKUB, 2015)*
a. Exclusive breastfeeding should be continued till 6 months of age followed by complementation with additional foods
b. Exclusive breastfeeding should be continued till 4 months of age followed by complementation with additional foods
c. Colostrum is the most suitable food for a newborn baby but it is best avoided in first 2 days
d. The baby should be allowed to breast-feed till one year of age

Breastfeeding week is celebrated on: *(ABKUB, 2018, 2023; SSUHSA, 2023)*
a. 1st week of March
b. 1st week of July
c. 1st week of August
d. 1st December

Breastfeeding should be initiated within _____ of birth.
a. One hour
b. 3 hours
c. One day
d. 3 days

The mid-year population of a village in Patna district was 3000 in the year 2003. There were 120 births and 30 infant deaths during the year. IMR of the village was: *(ABKUB, 2004; WBUHS, 2023)*
a. 90
b. 250
c. 750
c. 900

Keeping the baby's crib by the side of the mother bed is called: *(ABKUB, 2003)*
a. Wet nursing
b. Barrier nursing
c. Rooming in
d. Close nursing

Rooming in does not accomplish: *(ABKUB, 2019)*
a. Relieving mother's anxiety
b. Mother and baby's company
b. Breastfeeding baby
c. Birth control

The immunoglobulin that crosses placental barrier is: *(KIMS, 2016)*
a. IgG
b. IgA
c. IgM
d. IgE

Aims and objectives of "Under-five clinic" are all, *except*: *(SSUHSA, 2023)*
a. Care in illness
c. Growth monitoring
b. Immunization
d. Nonformal education for preschool children

MILY PLANNING:

NRR of 1 is equivalent to attaining approximately: *(KIMS, 2014)*
a. The 1 child norm
b. The 2 child norm
c. The 3 child norm
d. None of the above

Conventional contraceptive is related to: *(BNMUB, 2003)*
a. IUCD
b. IUD
c. Condom
d. Oral pill

A 35-year-old woman was brought to hospital with toxic shock syndrome. She was using some method of contraception. The method that leads to this condition is: *(AKUB, 2022)*
a. Condom
b. Diaphragm
c. Norplant
d. Vaginal douching

38. The most cost-effective family planning method is: *(ABKUB, 2017; DBRAUA, 2024)*
a. Vasectomy b. Tubectomy
c. Copper-T d. Oral pills

39. A newly married couple visits family planning center for contraception. Upon investigation, the woman have hyperlipidemia. The method of contraception which would be used cautiously in this woman is: *(AKUB, 2022; RUJH, 2023)*
a. Condom b. Mini pill
c. COCP d. 2nd generation IUCD
e. Norplant

40. Major side effect of oral contraceptive pills is: *(BNMUB, 2006)*
a. Nausea b. Metabolic changes
c. Nutritional changes d. Psychological manifestations

41. Which of the following is a male contraceptive measure: *(KIMS, 2014)*
a. IUCD insertion b. DMPA c. Condom d. OCP

42. DMPA injection is given: *(AKUB, 2022)*
a. 2 months b. 3 months c. 6 months d. 12 months

43. After vasectomy follow up should be continued up to: *(ABKUB, 2004)*
a. 6 weeks b. 12 weeks c. 6 months d. 3 years

44. Copper-T is made from: *(ABKUB, 2003)*
a. Polyurethane b. Polyethylene c. Both d. Polyvinyl chloride

45. IUCD acts by: *(ABKUB, 2020)*
a. Killing spermatozoa b. Aseptic inflammation of endometrium
c. Increasing cervical mucus d. Preventing the fertilization of ova

46. Absolute contraindication of IUCD is: *(AFUH, 2022)*
a. Anemia b. Diabetes c. PID d. Hemorrhage

47. CuT 380A IUD should be replaced once in: *(ABKUB, 2023)*
a. 4 years b. 6 years c. 8 years d. 10 years

48. MTP Act came into existence in: *(BNMUB, 2002, 2003)*
a. 1970 b. 1971 c. 1975 d. 1977

49. Best method for emergency contraception is: *(VKSUAB, 2021)*
a. IUCD b. High estrogen pills c. High progesterone pills d. Androgen

50. Contraceptive efficacy is measured by: *(AFUH, 2022)*
a. Pearl index only b. Pearl index and life table analysis
c. Life table analysis and couple protection rate d. Pearl index and couple protection rate

51. Pearl index is defined as: *(ABKUB, 2023)*
a. Failure rate per 10 women-years of exposure b. Failure rate per 100 women-years of exposure
c. Failure rate per 1000 women-years of exposure d. Failure rate per 1200 women-years of exposure

IMMUNIZATION AND VACCINE RELATED ISSUES:

52. Both active and passive immunity should be given simultaneously in all, *expect*: *(ABKUB, 2016)*
a. Tetanus b. Rabies c. Measles d. Hepatitis B

53. What kind of immunity is the transfer of maternal antibodies across the placenta? *(ABKUB, 2023)*
a. Passive immunity b. Humoral immunity c. Cellular immunity d. Herd immunity

GBS syndrome can develop in reaction to which vaccine: *(ABKUB, 2023)*
a. HiB b. Hep B c. Influenza d. Measles

The recommended vaccination strategy for rubella is to vaccinate first: *(AFUH, 2022, 2023)*
a. Infants b. Woman 15–49 years c. Children 1–14 years d. Adolescent girls

A 37 weeks pregnant women attends an ANC clinic, she has not had any antenatal care till now. The best approach regarding tetanus immunization in this case would be to: *(AFUH, 2022)*
a. Give a dose of TT and explain to her that it will not protect the born and she should take the second dose after 4 weeks even if she delivers in meantime
b. Don't waste the TT vaccine as it would anyhow be of no use in this pregnancy
c. Give one dose of TT and explain that it will not be useful in this pregnancy
d. Give her antitetanus immunoglobulin along with the TT vaccine

How many fully frozen ice packs should a vaccine carrier contain? *(ABKUB, 2018, 2020)*
a. 2 b. 4 c. 6 d. 8

AEFI: *(GITAMAP, 2023)*
a. Adverse effect following immunization
b. Any events following immunization
c. Acute following immunization
d. All events following immunization

Maximum cold chain failure occurs: *(ABKUB, 2023)*
a. At manufacturer level
b. During transport
c. At subcenter level and below
d. At district storage level

Which one of the following is not a live vaccine? *(KIMS, 2017)*
a. BCG b. Yellow fever c. OPV d. Hepatitis B

The most heat-sensitive vaccine is: *(ABKUB, 2018; AKUB, 2023)*
a. BCG b. Polio c. Measles d. DPT

Polio is due to: *(ABKUB, 2020)*
a. Virus b. Bacteria c. Protozoa d. Fungus

Salk vaccine is a: *(ABKUB, 2017; AFUH, 2022)*
a. Live vaccine b. Live attenuated vaccine c. Killed vaccine d. Toxoid

Which one of the following vaccine is least heat sensitive? *(BNMUB, 2002)*
a. OPV b. BCG d. DPT d. TT

Which vaccine is least sensitive to heat? *(ABKUB, 2023)*
a. OPV b. IPD c. Yellow fever d. Hep-B

DPT is kept at: *(BNMUB, 2002)*
a. -20° C temperature
b. +20° C temperature
c. +2 to +8° C temperature
d. +4 to 8° C

Which vaccine should not be kept at -20°C temperature: *(BNMUB, 2002; SSUHSA, 2023)*
a. All T series vaccine b. OPV c. Measles d. None of the above

If convulsions are present, which vaccine should not be given? *(ABKUB, 2020)*
a. DPT b. Oral polio c. BCG d. Tetanus toxoid

Which category of cold chain equipment are the preferred option where there is reliable electricity for at least 8 hours per day?
a. Ice lined refrigerator b. Solar refrigerator c. Kerosene refrigerator d. All of the above

Which of the following is not an electrical cold chain equipment? *(ABKUB, 2021)*
a. Walk-in coolers b. Walk-in freezers c. Cold box d. Deep freezer

71. 17-D vaccine is used for protection against: (ABKUB, 20[illegible])
a. Dengue fever b. Malaria c. Yellow fever d. Japanese encephalitis

72. A woman in the seventh month of pregnancy reports to you in the antenatal clinic for the first time. The recommended immunization for her: (ABKUB, 20[illegible])
a. Tetanus toxoid b. Hepatitis B vaccine
c. Rubella vaccine d. Tetanus immunoglobulin

73. A woman reports for vaccination against Tetanus only 25 days before delivery, she has not received the first dose, what will you do: (AKUB, 20[illegible])
a. Give antitetanus immunoglobulin
b. Give two dose of TT with 2 weeks interval
c. Give one dose of TT and advice second dose after delivery
d. Advice passive immunization after delivery

74. Best preventive measure against tetanus neonatorum: (VKSUAB, 20[illegible])
a. Active immunization b. Passive immunization of child
c. Active immunization of child d. Passive immunization of mother

75. The vaccine used for the prevention of Yellow fever is: (YSRUHSAP, 20[illegible])
a. 17D vaccine b. Simple vaccine c. Live vaccine d. Zaire vaccine

MISC:

76. All are true about juvenile delinquency, *except*: (WBUHS, 20[illegible])
a. Juvenile is a boy who has not attained age of 16 years
b. Juvenile is a girl who has not attained age of 18 years
c. Delinquency simply means "Juvenile crime"
d. It embraces all deviations from normal youthful behaviors

77. The emergency contraceptive pill should be used within a maximum period of: (MGUB, 2023, 20[illegible])
a. 24 hours b. 48 hours c. 72 hours d. 96 hours

78. Use of combined oral contraceptive accounts for an increase in risk of: (TRIU, 20[illegible])
a. Breast cancer b. Ovarian cancer c. Endometrial cancer d. None of the above

79. The temperature of the cold chain system is _____ degrees centigrade: (SSUHSA, 20[illegible])
a. 2–7 b. 3–7 c. 2–8 d. 3–8

80. Rotavirus vaccine used in the National Immunization Programme is a: (TRIU, 20[illegible])
a. Live vaccine b. Killed vaccine
c. Recombinant DNA vaccine d. Plasma-derived DNA vaccine

81. Chickenpox is mainly transmitted through: (TRIU, 20[illegible])
a. Skin to skin contact b. Contaminated food
c. Droplet infection d. Airborne transmission

82. Subclinical cases are least likely to occur in: (TRIU, 20[illegible])
a. Hepatitis A b. Diphtheria
c. Measles d. Poliomyelitis

83. Herd immunity not seen in: (SSUHSA, 2023; AFUH, 20[illegible])
a. Polio b. Measles c. Diphtheria d. Tetanus

84. An infected person is less likely to encounter a susceptible person when large proportion of the members of the group are immune: (RUJH, 2023; GNSUB, 20[illegible])
a. Active immunity b. Passive immunity c. Herd immunity d. Specific immunity

Which one of the following is NOT true about inactivated vaccine? *(WBUHS, 2023)*

a. It can stimulate active immunity when injected
b. It is safer than the live attenuated vaccine
c. It require booster doses for maintaining immunity
d. It is affected by circulating antibody against the disease

Best indicator to evaluate obstetric and neonatal care given at around the time of birth: *(AFUH, 2023; RUJH, 2024)*

a. Infant mortality rate
b. Under 5 mortality rate
c. Perinatal mortality rate
d. Still birth rate

All are the following are causes of MMR in India, *except*: *(SSUHSA, 2024)*

a. PPH b. PIH c. Anemia d. None of the above

_____ is not in 5 "Cleans" in conduct of delivery: *(ABKUB, 2023; GNSUB, 2023)*

a. Clean hands
b. Clean perineum
c. Clean cutting and care of cord
d. Clean surface

All of the following are high-risk ANC, *except*: *(ABKUB, 2023; GNSUB, 2023)*

a. Elderly primi b. Pre-eclampsia c. Twin pregnancy d. None of the above

A total of _____ tablets of iron and folic acid are given as recommended to every pregnant women by health worker during antenatal period: *(DBRAUA, 2024)*

a. 50 b. 60 c. 100 d. 180

Commonest cause of neonatal mortality in India is: *(WBUHS, 2023, 2024)*

a. Diarrheal diseases
b. Birth injuries
c. Low birth weight/Preterm
d. Congenital anomalies

Most common neonatal disorder screened is: *(AFUH, 2023)*

a. Neonatal hypothyroidism
b. Phenylketonuria
c. Hemoglobinopathies
d. Congenital dislocation of hip

APGAR score does not contain: *(VBUJH, 2023)*

a. Heart rate b. Muscle tone c. Reflex response d. Respiratory rate

Maternal death is defined as, when mother dies during pregnancy or at the time of delivery or after delivery up to: *(AFUH, 2023)*

a. 4 weeks b. 6 weeks c. 8 weeks d. 10 weeks

The number of live births is a denominator for all of the following mortality indicators, *except*: *(TRIU, 2024)*

a. Maternal mortality ratio
b. Under 5 mortality rate
c. Infant mortality rate
d. Perinatal mortality rate

The denominator for calculating maternal mortality rate is _____: *(KIMS, 2024)*

a. Total no of live birth
b. Total no of live birth and still births
c. Total number of infants
d. Total number of women in reproductive age group

Risk of damage of fetus due to maternal rubella is maximum if mother gets rubella in: *(TRIU, 2024)*

a. 6–12 weeks of pregnancy
b. 20–24 weeks of pregnancy
b. 24–28 weeks of pregnancy
d. 32–36 weeks of pregnancy

A primigravida with 30 weeks of gestation visit OPD for routine check up. Her BP was found to be 160/90 mm Hg. The doctor advised to report immediately, if she develops: *(VNSGUS, 2023)*

a. Abdominal pain b. Vaginal bleeding c. Tinnitus
d. Swelling of feet e. Fever

99. Under MTP Amendment Act 2021, for rape survivors medical termination of pregnancy can be carried out maximum for up to: (AKUB, 2024)
a. 12 weeks b. 20 weeks c. 24 weeks d. 28 weeks

100. Adolescents in RMNCH+A represent the age group of: (MGUB, 2024)
a. 11–18 b. 10–19 c. 10–18 d. 12–19

101. Fast breathing to diagnose pneumonia in a 6-month-old infant is more than _____ breaths/min (MU, 2024)
a. 50 b. 40 c. 60 d. 20

102. If a 7-month-old child has fast breathing means it's breath count: (AKUB, 2023)
a. ≥60 b. ≥40
c. ≥50 d. Any breath count along with chest in-drawing

103. A child aged 24 months was brought to the primary health center with complaints of cough and fever for the past 2 days. On examination, the child weighted 10 kg, respiratory rate was 42 per minute, chest indrawing was present. The most appropriate line of management for this patients is: (VBUJH, 2023)
a. Classify as pneumonia and refer urgently to secondary level hospital
b. Classify as pneumonia, start antibiotic and advice to report after 2 days
c. Classify as severe pneumonia, start antibiotics and refer urgently
d. Classify as severe pneumonia and refer urgently

104. Which of the following drugs is the mainstay of the ARI control program? (DBRAUA, 2024)
a. Amoxycillin b. Ampicillin c. Ciprofloxacin d. Cotrimoxazole

105. A 25-year-old mother came to sub-center for family planning advice. She has a 2 month old child, who is exclusively breast fed. Which contraceptive is contraindicated for her? (WBUHS, 2023)
a. Combined pill b. Progesterone only pill c. DMPA d. Intrauterine device

106. Most common side-effects of IUD insertion: (RUJH, 2023)
a. Pain b. Infection c. Bleeding d. Ectopic pregnancy

107. Ectopic pregnancy is mostly associated with: (AKUB, 2023)
a. First generation IUD b. Second generation IUD
c. Third generation IUD d. Conventional contraceptives

108. Third generation IUCD is: (AFUH, 2023)
a. ML CuT 250 b. CuT 380A c. Copper-7 d. MIRENA

109. Absolute contraindications of IUD include all, *except*: (DBRAUA, 2024)
a. Anemia b. Suspected pregnancy
c. Pelvic inflammatory disease d. Cancer cervix

110. Which of the following is not the likely adverse effect of oral contraceptive pills: (DBRAUA, 2024)
a. Menorrhagia b. Breast heaviness c. Oligomenorrhea d. Dysmenorrhea

111. PCPNDT Act is regarding: (AFUH, 2023)
a. Prevention of unauthorized kidney transplantation
b. Prevention of child trafficking
c. Prevention of female feticide
d. Prevention of narcotic abuse

112. Immunization is: (TRIU, 2024)
a. Health promotion b. Specific protection
c. Early detection treatment d. Rehabilitation

How many diseases are covered under Mission Indradhanush? *(RUJH, 2023)*
a. 5 b. 7 c. 9 d. 12

Components of cold chain are MET; here T stands for: *(AKUB, 2023)*
a. Time b. Temperature
c. Transdermal inoculation d. True load

DPT vaccine is an example of: *(DBRAUA, 2024)*
a. Combined and mixed vaccine b. Antisera
c. Single vaccine d. None of the above

Koplik spots are seen in: *(DBRAUA, 2024)*
a. Pertussis b. Measles c. Chickenpox d. Rubella

Whooping cough is caused by: *(DBRAUA, 2024)*
a. M. tuberculosis b. B. pertussis c. C. tetani d. Y. pestis

Mumps is caused by: *(DBRAUA, 2024)*
a. DNA virus b. RNA virus c. Bacteria d. Protozoa

Strain used for BCG vaccine production is: *(DBRAUA, 2024)*
a. R-19 b. Danish 1331 e. Omega-60 d. None of the above

Diluent used in MR/Measles vaccine is: *(GNSUB, 2023)*
a. Normal saline b. Distilled water c. Double distilled water d. None of the above

Interval between two doses of Covishield? *(RUJH, 2023)*
a. 1 month b. 2 months c. 3 months d. 15 days

Vaccine can be used in sub-center: *(ABKUB, 2023) Ch-10*
a. 1 day b. 7 days c. 15 days d. 30 days

The level of immunity that is present in a population against an infectious agent is known as: *(ABKUB, 2023)*
a. Innate immunity b. Acquired immunity c. Selective immunity d. Herd immunity

In Measles, infective period is: *(VBUJH, 2023)*
a. 3 days before and 4 days after the appearance of rash
b. 4 days before and 3 days after the appearance of rash
c. 4 days before and 5 days after the appearance of rash
d. 5 days before and 4 days after the appearance of rash

All are true about measles infection, *except*: *(WBUHS, 2024)*
a. Measles vaccine contains attenuated Edmonston strain on chick embryo cell using medium 199
b. For elimination of measles MCV2 coverage must be 95%
c. Period of infectivity is 5 days before rash to 4 days after rash
d. Rare complications like febrile convulsions, encephalitis and SSPE can be more serious and dangerous than common complications

Which of the following is not true of Measles? *(VNSGUS, 2023)*
a. High secondary attack rate b. Only one strain causes infection
c. Not infectious in prodromal stage d. Infections confers lifelong immunity

All are true about measles, *except*: *(RUJH, 2024)*
a. Both active and passive immunization are given simultaneously
b. Flaring up of TB
c. Most infectious during rashes
d. Causes pneumonia and otitis media

128. Toxic shock syndrome is due to which vaccine: (GNSUB 2022)
a. Tetanus
b. Mumps
c. Salk
d. Measles

129. A baby was given a dose of measles vaccine at 6 months of age due to epidemic of measles in malnutrition. Correct regarding giving subsequent dose will be: (GNSUB 2022)
a. Give one more dose as soon as possible
b. Give after 14–16 months with booster dose
c. Give after 9 months age
d. No dose required

130. A critical step in Polio Eradication is "Switch" which refers to: (ABKUB 2022)
a. Replacement of tOPV with bOPV
b. Replacement of OPV with IPV
c. Both of the above
d. None of the above

131. Which of the following vaccine is not a live vaccine: (KIMS 2019)
a. Rubella
b. Varicella
c. OPV
d. IPV

132. Revised f-IPV schedule in National Immunization Schedule is: (AFUH 2025)
a. 2 doses at 6 weeks and 14 weeks
b. 3 doses at 6 weeks, 10 weeks and 14 weeks
c. 2 doses at 6 weeks and 10 weeks
d. 3 doses at 6 weeks, 14 weeks and 9 months

133. Neonatal Tetanus is said to be eliminated when the rate is: (AFUH 2025)
a. >10 per 1000 LB
b. >1 per 1000 LB
c. <1 per 1000 LB
d. <0.1 per 1000 LB

134. Minimum gap that should be allowed in between to administer two live vaccines: (VNSGUS 2025)
a. 2 weeks
b. 4 weeks
c. 2 months
d. 4 months

135. Vaccines given at birth? (VNSGUS 2025)
a. Pentavalent, MR, Hib
b. BCG, OPV, MR
c. BCG, OPV, Hep B
d. BCG, IPV, Hep B

136. A women in the seventh month of pregnancy report to you in the antenatal clinic for the first time. The recommended immunization is: (VNSGUS 2025)
a. Tetanus toxoid
b. Hepatitis B vaccine
c. Rubella vaccine
d. Pneumococcal vaccine
e. Tetanus immunoglobin

137. Pentavalent vaccine does not protect against which of the following diseases? (TRIU 2024)
a. Diphtheria
b. Measles
c. Hepatitis B
d. Haemophilus influenzae B

138. Treatment of choice for Diphtheria carrier is: (TRIU 2024)
a. Erythromycin
b. Tetracycline
c. Penicillin
d. Amikacin

139. WHO vaccination strategy of catchup, keep up and follow-up has been designed for: (TRIU 2024)
a. Polio
b. Typhoid
c. Measles
d. Diphtheria

140. A primigravida delivered a male baby in the obstetric ward of NBMCH. The doctor referred the baby on the same day to the immunization center for vaccination of: (AKUB 2024)
a. BCG only
b. BCG and OPV
c. BCG, OPV and HBV
d. BCG OPV and HPV

141. Mg^{++} is used in OPV vaccine as: (RUHI 2024)
a. Stabilizer
b. Adjuvant
c. Preservative
d. Vehicle

142. Kayakalp Programme is directed for: (WBUHS 2024)
a. Hospital hygiene
b. Hospital administration
c. Health promotion
d. Environmental sanitation

ers:																			
b	2.	d	3.	c	4.	b	5.	b	6.	a	7.	d	8.	c	9.	b	10.	c
b	12.	c	13.	a	14.	c	15.	c	16.	d	17.	c	18.	d	19.	b	20.	b
d	22.	a	23.	a	24.	a	25.	d	26.	d	27.	a	28.	c	29.	a	30.	b
c	32.	d	33.	a	34.	d	35.	b	36.	c	37.	b	38.	a	39.	c	40.	a
c	42.	b	43.	b	44.	b	45.	b	46.	c	47.	d	48.	b	49.	a	50.	b
b	52.	c	53.	a	54.	c	55.	a	56.	a	57.	b	58.	a	59.	b	60.	d
b	62.	a	63.	c	64.	d	65.	d	66.	c	67.	a	68.	a	69.	a	70.	c
c	72.	a	73.	c	74.	d	75.	a	76.	c	77.	c	78.	a	79.	c	80.	a
c	82.	c	83.	d	84.	c	85.	d	86.	c	87.	d	88	b	89.	d	90	d
c	92.	a	93.	d	94.	b	95.	b	96.	a	97.	a	98.	d	99.	c	100.	b
a	102.	c	103.	c	104.	d	105.	a	106.	c	107.	c	108.	d	109.	a	110.	a
c	112.	b	113.	d	114.	b	115.	a	116.	b	117.	b	118.	b	119.	b	120.	c
c	122.	a	123.	d	124.	a	125.	c	126.	c	127.	a	128.	d	129.	c	130.	a
d	132	d	133	d	134	b	135.	c	136.	a	137.	b	138.	a	139.	c	140.	c
a	142.	a																

FILL IN THE BLANKS

1. Minimum _____ antenatal check-ups are provided under RCH program. *(KIMS, 2016)*
2. Minimum numbers of antenatal check-ups are provided under Essential Obstetric Care. *(KIMS, 2014)*
3. Denominator in maternal mortality is _____. *(SAMU, 2015)*
4. Late maternal death is the death of a women _____ days but less than _____ after termination of pregnancy. *(VKSUAB, 2016)*
5. Janani Suraksha Yojana was launched in the year _____. *(VKSUAB, 2019)*
6. A Dai is trained for _____ working days. *(VKSUAB, 2014)*
7. World Breastfeeding Week is celebrated in the month of _____. *(SAMU, 2015)*
8. _____ is known as "Captain of the Men of Death". *(VKSUAB, 2014)*
9. Chest Indrawing is general danger sign of _____ according to IMNCI Guidelines. *(KIMS, 2017)*
10. FIMNCI stands for _____. *(VKSUAB, 2013, 2016)*
11. On an average, a normal healthy woman gains about _____ kg of weight during pregnancy. *(VKSUAB, 2018)*
12. MMR in India _____ per lakh. *(VKSUAB, 2018)*
13. Advice for use of IUCD, condom, oral pill comes under _____ and tubal ligation and vasectomy come under _____ of family planning. *(SAMU, 2011)*
14. _____ is an indicator of prevalence of contraceptive practice in the community. *(KIMS, 2016)*
15. Pearl index is expressed in _____. *(SAMU, 2015)*
16. _____ and _____ are given as part of the immunization program before one month of age. *(SAMU, 2011)*
17. BCG vaccine is administered _____ through route. *(BNMUB, 2005)*
18. Immunization against diphtheria is best accomplished by _____ (now a days it is Pentavalent vaccine, booster dose of DPT is given at 16–24 months and 5–6 years of age of the child). *(BNMUB, 2005)*

19. Measles vaccine is a _____ vaccine. (KIMS, 20
20. In India Measles vaccination is given by _____ route. *(KIMS, 2019)* (Intraderm
Subcutaneous/Intramuscular/Intranasal).
21. The best age for immunization against measles is _____. (BNMUB, 20
22. Program promoting cleanliness at public healthcare facilities is called _____ (MU, 20

Answers:

1. 4 (Four)
2. 4 (Four)
3. Number of Live Birth
4. After 42 days; 1 (One) year
5. 2005 (12th April by Honorable PM)
6. 30
7. August (1st August to 7th August)
8. Pneumonia
9. Severe Pneumonia
10. Facility-based Integrated Management of Neonatal and Childhood Illnesses
11. 9–11
12. 97 (SRS: 2018-20)
13. Temporary method; Permanent method
14. Couple Protection Rate (CPR)
15. Failure per 100 women years of exposure
16. Hepatitis B vaccine (Birth dose); BCG vaccine
17. Intradermal
18. DPT vaccine
19. Live attenuated
20. Subcutaneous
21. 9 months to one year
22. Kayakalp

TRUE/FALSE

1. BCG is live attenuated freeze-dried viral vaccines. *(SAMU, 201*
2. IMNCI target group is up to 5 years. *(SAMU, 201*

Answers:

1. False
2. True

CHAPTER 11

Occupational Health

CM11.3: Enumerate and describe specific occupational health hazards, their risk factors and its preventive measures.

Q1. List (Classify) the occupational diseases (hazards). What are the measures to be taken for prevention and control of occupational disease for workers? *(WBUHS, 2017, 2020, 2021, 2022, 2024; AKUB, 2022; BNMUB, 2016, 2020; ABKUB, 2019; YSRUHSAP, 2023; PBDSUHSH, 2017; SMU, 2011; SSUHSA, 2016, 2017, 2018, 2021; TDMGRMU, 2008; RGUHS, 2010; SAMU, 2022; RUJH, 2021; SDVPG, 2023; GOAU, 2023, KIMS, 2023; VNSGUS, 2023; MGUIB, 2023)*

Ans: Occupational hazards:

Diseases due to **physical agents**

A. Physical agents	***Disease caused***
Heat	Heat hyperpyrexia, heat exhaustion, heat syncope, heat cramps, burn and local effects, such as prickly heat
Cold	Trench feet, frostbite, chilblains
Light	Occupational cataract, Miners' nystagmus
Pressure	Caisson disease, air embolism, blast (explosion)
Noise	Occupational deafness
Radiation	Cancer, leukemia, aplastic anemia, pancytopenia
Mechanical factors	Injuries, accident
Electricity	Burn
B. Chemical agents	
a. Gases	Hazards due to gases like carbon dioxide, carbon monoxide, carbon disulfide, ammonia, hydrogen sulfide, etc., may cause gas poisoning
b. Dusts (Pneumoconiosis)	
Inorganic dusts:	
Coal dust	Anthracosis
Silica	Silicosis
Asbestos	Asbestosis, cancer lung
Iron	Siderosis
Organic dusts:	
Cane fiber	Bagassosis
Cotton dust	Byssinosis
Tobacco	Tobaccosis
Hay or grain dust	Farmer's lung
Metals and their compounds:	
Compounds	Toxic hazards from lead, mercury, cadmium, manganese, arsenic, chromium, etc.
Chemicals	Acids, alkalies, pesticides

Contd...

Contd...

Solvents	Benzene, carbon disulfide, trichloroethylene, chloroform, etc.
C. Biological agents	Brucellosis, leptospirosis, anthrax, actinomycosis, hydatidosis, tetanus, encephalitis, fungal infections, etc.
D. Occupational cancer	Cancer of skin, lung and bladder
E. Occupational dermatosis	Dermatitis, eczema
F. Psychological	Industrial neurosis, hypertension, peptic ulcer, etc.

Q1a. Measures are taken for prevention and control of occupational diseases. *(SDVPG, 2023)*

Ans:

A. **Medical measures:**

- *Preplacement examination. (WBUHS, 2010, 2012, 2016; RGUHS, 2008; SAMU, 2013, 2015; TDMGRMU, 2014; SSUHSA, 2010; NU, 2009; TRIU, 2023; DBRAUA, 2024)*
  Preplacement examination is also called pre-employment examination. It is the foundation of an efficient occupational health services. It is done at the time of employment. Biological examination includes routine blood test, stool and urine test. X-ray chest is the most common radiological examination. Other special tests like visual acuity, ECG are commonly done.
  Purpose of this examination: A fresh recruit may either be totally rejected or a job is given suitable to his physical and mental abilities. Preplacement examination will also serve as a benchmark for future comparison.
  Examples of hazards and its impact: The following is a list of some occupations dealing with the hazards where the employee may suffer from certain diseases. So the person suffering from the same kind of disease of any degree should not be placed in those jobs with presence of the mentioned hazards.

Hazard	*Undesirable condition*
Lead	Anemia, hypertension, nephritis, peptic ulcer
Dyes	Asthma; skin, bladder, kidney diseases; precancerous lesions
Solvents	Liver and kidney disease, dermatitis, alcoholism
Silica	Healed or active tuberculosis of lungs, chronic lung disease
Radium and X-rays	Signs of ill health, especially blood diseases

- *Periodical examination.* *(WBUHS, 2011; MGUB, 2024)*
  Many diseases of occupational origin require months or years for their development. Their slow development, very often, leads to nonrecognition in the early stages and that is harmful to the worker. This is the reason, why a periodic medical check-up of worker is necessary when they handle toxic or poisonous substances. The frequency and content of periodic medical examination will depend on type of occupational exposure. Ordinarily workers are examined once a year. But in certain occupational exposures, monthly examinations are indicated. Sometimes, even **daily examinations may be needed, such as when irritant chemicals like dichromates are handled**. The periodical examinations may be supplemented, when necessary by biological and radiological examinations. Particular care should be given to workers returning from medical leave, to assess the nature and degree of any disability and to assess suitability or otherwise of returning to the same job.
  Objectives: To protect the individual from further complication and to prevent the spread of disease from the affected individual to others and thus it helps in prevention of occupational diseases.
- *Medical and healthcare services:* The medical care of occupational disease is a basic function of an occupational health service. In India, the ESI scheme provides medical care not only for the worker but also his family. Within the factory, first aid services should be made available.
- *Notification:* The main purpose of notification is to initiate measures for prevention and protection of workers from occupational diseases. In the Factories Act, a list of 22 diseases is included, while in Mines Act 3 diseases and in the dock regulation, 8 diseases are enlisted.

- *Supervision of the working environment:* Periodic inspection of working environment provides information of primary importance in the prevention of occupational disability. The physician should pay frequent visits to the factory in order to acquaint himself with the various aspects of working environment, such as temperature, lighting, ventilation, humidity, noise, cubic place which have important aspects on the health and welfare of the workers.
- *Maintenance and analysis of records:* Proper records are essential for the planning, development and efficient operation of occupational health services. The worker's health record and occupational disability record must be maintained.
- *Health education and counseling:* Health education and counseling should start before the worker enters the factory. All the risks involved in the industry in which he is employed and the measures to be taken for personal protection should be explained to him. The correct use of protective device like masks and gloves should also be explained. The purpose of health education is to assist the worker in his process of adjustment to work place, home and community.

5. **Engineering measures:**
   - *Designing of the building:* Measures for prevention of occupational diseases should commence in the blue-print stage. The type of floor, walls, height, ceiling, roof, doors and windows, cubic space should be in-built in original plan and also done by industrial architect.
   - *Good house-keeping:* It covers general cleanliness, ventilation, lighting, washing, food arrangement and general maintenance. The dust settles in the different part of the building should be removed by vacuum cleaners.
   - *General ventilation:* Good general ventilation decreases hazards from air-borne diseases to workers especially dusts and gases.
   - *Exhaust ventilation:* Escape of dust into atmosphere can be prevented by special enclosure or cabinets or hood for the machinery at the point of origin of dust. Such enclosures are usually combined with exhaust ventilation.
   - *Mechanization:* It is needed to reduce the hazards of contact with harmful substances. Dermatitis can be prevented through mechanical devices instead of hand-mixing. Acids can be transferred from one place to another through pipes.
   - *Substitution:* Replacement of harmful materials can be done by harmless one or of lesser toxicity. Zinc or iron plants can be used in place of harmful lead paints. Acetone can be used in case of benzene.
   - *Dusts:* Dusts can be controlled at the point of origin, e.g., wet drilling of rock.
   - *Enclosure:* Grinding machinery can be completely enclosed.
   - *Isolation:* It may be done isolate the offensive process in a separate building so that the worker not directly involved with the operation. Certain operation can be done at night in absence of usual staff.
   - *Protective devices:* Workers should protect themselves by using respirators, gas masks, ear plugs, ear muffs, helmets, safety shoes, aprons, gum boots, screens and goggles, etc.
   - *Environmental monitoring:* Regular periodical environmental surveys, collection of samples to assess the dusts and gases in the environment with permissible limits.
   - *Statistical monitoring:* Regular collecting of data on health and environmental exposure of occupational groups and analysis of data can be adopted to follow the situation.
   - *Research:* Study of permissible limits of exposure to dusts and toxic fumes, occupational cancer, accident prevention, industrial fatigue are some important aspects of research in occupational health.

C. **Legislative measures:** The factory laws have framed in India to govern the conditions in industry and safeguard the health and welfare of the worker. The most important factory laws in India are (1) the Factories Act, 1948 and (2) the Employees' State Insurance Act, 1948.

Q11. Many cases of silicosis were reported from a pottery and ceramic industry. As an Industry Health Officer, Write epidemiology and what measure will you recommend for prevention and control of the problem. *(WBUHS, 2014, 2023; BNMUB, 2020; RGUHS, 2014; RUJH, 2012; NU, 2015, 2016; AKUB, 2023; GOAU, 2022; TRIU, 2023)*

Ans:

A. **Agent factors:**
- *Chemical composition:* More complicated the composition of dust, greater the hazard.
- *Size of particles:* Particles of 0.5–3 micron diameter are most dangerous
- *Total dose:* Higher the dose earlier the manifestations
- *Duration of exposure:* Prolonged exposure leads to severe disease

B. **Host factors:**
- *Susceptibility of individuals:*
  - Individuals with respiratory infections are more susceptible
  - Better health and nutritional status, lesser chance of silicosis
- *Occupation:* It is seen in sand stone, granite, potter, ceramic, gold, mica and steel industry etc.

C. **Environmental factors:**
- *Poor ergonomics:*
  - Measure for reduction of silica if inadequate, the incidence of silicosis will increase.
  - Protective devices should be available in the working area and its use should be implemented by the authority.
  - Education for protection of workers is lacking in the industries.

Prevention of silicosis:

A. Primary prevention:

Health promotion: It can be done by the following measures:
- Preplacement
- Health education
- Provision of healthy physical environment

Specific protection:

Control of dust: This includes the followings:
- Prevention of formation of dust at the point of origin by water sprays, e.g., wet drilling of rock. Wet methods should be tried to combat dust before more elaborate and expensive methods are adopted.
  - Prevention of escape of dust into atmosphere—Escape of dust into atmosphere can be prevented by special enclosure or cabinets or hood for the machinery at the point of origin of dust. Such enclosures are usually combined with exhaust ventilation. The dust is drawn into the hood and conveyed through ducts into collecting units. Thus, the breathing zone of the workers may be kept free of dangerous dust and poisonous fumes.
  - The workers should protect themselves by using respirators, gas masks, ear plugs, ear muffs, helmets, safety shoes, aprons, gum boots, screens and goggles, etc.
  - Substitution
  - Complete enclosure of the operation
  - Isolation
  - Good house keeping
  - Hydroblasting

B. **Secondary prevention:**

Early diagnosis and treatment: There is no specific treatment for silicosis. Fibrotic changes that have already taken place cannot be reversed. The workers should undergo periodic medical examination including X-ray chest, so that cases of respiratory distress can be detected early and removed from the offending occupation and are given some other job. It should be noted that silicosis was made a notifiable disease under the Factories Act 1948 and Mines Act 1952.

C. **Tertiary prevention:** Disability limitation and rehabilitation

CM11.1: Enumerate and describe the presenting features of patients with occupational illness including agriculture.

Q2 What do you mean by pneumoconiosis? What are the factors influencing it? Enumerate its different types with causative factors. How do you control and prevent it?

(WBUHS, 2016, 2018; AKUB, 2022; AFUH, 2022; BNMUB, 2018, 2019; ABKUB, 2017, 2022; VKSUAB, 2019; TRIU, 2021, 2023; RGUHS, 2012, 2006; SSUHSA, 2012, 2022, 2024; BUMP, 2010; DU, 2016; SMU, 2014; NU, 2015; SAMU, 2022; MU, 2022; GOAU, 2022; VNSGUS, 2023)

Ans: Dusts within the range of 0.5–3 micron being a health hazard produce after a variable period of exposure, an incurable lung disease known as pneumoconiosis which may gradually cripple a man by reducing his working capacity due to lung fibrosis and other complications. Hazardous effects of dusts on lungs depend on number of factors:

- Chemical composition
- Fineness
- Concentration of dust in the air
- Period of exposure
- Health status of the person exposed

Enumeration of different types of pneumoconiosis:

Name of the disease	*Causative factors*
Silicosis	Silica or silicon dioxide
Anthracosis	Coal dust
Byssinosis	Cotton dust
Bagassosis	Sugar cane dust
Asbestosis	Asbestos dust
Farmer's lung	Hay or grain dust

A brief account of the above-mentioned diseases discussed below:

A. **Silicosis:** It is caused by inhalation of dust containing free silica or silicon dioxide. This disease is common **in following industries:**
   - Mining industry
   - Pottery and ceramic industry
   - Sand blasting
   - Metal grinding
   - Building and construction work
   - Iron and steel industry

   Clinical features: Irritant cough, dyspnea on exertion, pain in chest, impairment of total lung capacity.
   Pathological features: Dense nodular fibrosis, nodules ranging 3–4 mm in diameter.
   X-ray findings: Snow storm appearance.
   Treatment: No definite treatment is present. Symptomatic relief is only measure.
   Prevention: Preventive measure for silicosis works in better way.

B. **Anthracosis:** It is common in cool mine industry. There are two phases in anthracosis.
   Simple pneumoconiosis: It is associated with mild ventilator impairment.
   Progressive massive fibrosis: This causes severe respiratory disability and frequently results in premature death.

C. **Byssinosis:** It is due to inhalation of cotton fiber dust over a period of time. The symptoms are chronic cough and progressive dyspnea, ending in chronic bronchitis and emphysema.

D. **Bagassosis:** This disease is caused by inhalation of bagasse or sugar cane dust. It was first reported in cardboard manufacturing firm.
   Clinical features: Breathlessness, cough, hemoptysis, slight fever.

Pathological feature: Diffuse bronchiolitis, fibrosis, emphysema, bronchiectasis.
Radiological feature: Mottling in the lungs.

E. **Asbestosis** *(RGUHS, 2009; RUJH, 2012, 2013; TDMGRMU, 2008; DU, 2015, 2020)*
Asbestosis is the commercial name given to certain type of fibrous material. They are silicates of varying composition. Silica is combined with magnesium, iron, calcium, sodium, etc. Asbestos is of two types— Serpentine and amphibole type. It enters the body by inhalation and fine dust may be deposited in alveoli. It is used in the manufacture of asbestos cement, fireproof textiles, roof tiling, brake lining, gaskets and other items.
Clinical features: Cough, dyspnea, clubbing of the fingers, cyanosis.
Pathological feature: Lung fibrosis, which is diffuse in character, basal in location. Carcinomas of the bronchus, mesothelioma of the pleura/peritoneum, cancer of the GI tract are often seen.
X-ray findings: Ground glass appearance.

F. **Farmer's lung** *(ABKUB, 2005, 2015; SAMU, 2009)*
It is due to inhalation of moldy hay or grain dust. In grain dust with moisture content above 30% bacteria and fungi grow rapidly, causing a rise of temperature to 40–50°C. This heat encourages the growth of thermophilic actinomycetes, of which *Micropolyspora faeni* is the main cause of farmer's lung.

Prevention of pneumoconiosis:

Primary prevention:

Health promotion: It can be done by the following measures:

A. **Preplacement examination:** This consists of thorough examination of individuals before giving the job. This includes not only thorough physical examination but also routine investigations including X-ray chest. Suitable job is given depending upon the physical and mental ability.
B. **Health education:** Employees at a risk of pneumoconiosis are educated about the hazards of dust inhalation over long period and hazards of smoking.
C. **Provision of healthy physical environment:** Cleanliness, adequate ventilation, lighting, water supply and good house-keeping are mandatory in the industries. Masks, gloves, aprons, etc., should be clean and usable at any moment.
D. **Control of dust:**
   - Prevention of formation of dust at the point of origin by water sprays, e.g., wet drilling of rock.
   - Prevention of escape of dust into atmosphere—escape of dust into atmosphere can be prevented by special enclosure or cabinets or hood for the machinery at the point of origin of dust. Thus, the breathing zone of the workers may be kept free of dangerous dust and poisonous fumes.
     Specific protection: The workers should protect themselves by using respirators, gas masks, ear plugs, ear muffs, helmets, safety shoes, aprons, gum boots, screens and goggles, etc.

Secondary prevention:

Early diagnosis and treatment: The workers should undergo periodic medical examination including X-ray chest, so that cases of respiratory distress can be detected early and removed from the offending occupation and are given some other job.

Tertiary prevention:

Disability limitation: This consists of limiting further disability of the worker by the slightest degree of disability and assigning some other suitable job.
Rehabilitation: This is required for the workers who have become handicapped due to development of fibrosis in the lungs. They require physical, social, psychological and vocational rehabilitation.

Q2a. Describe occupational hazards of agricultural workers. *(WBUHS, 2019; BNMUB, 2022; RGUHS, 2010, 2012, 2013; SAMU, 2007, 2013; TDMGRMU, 2016; SSUHS, 2015, 2023; KIMS, 2014; SMU, 2012; NIMSUR, 2015; MU, 2023)*

Ans: Agricultural occupation involves all the activities connected with ploughing of soil, growing crops, harvesting, processing of crops, breeding, raising and caring for animals including poultry and nurseries. It also includes handling of machines, tools, insecticides, pesticides, etc.

Agricultural occupation differs from other occupation in many ways.

Health hazards of agricultural workers (occupation)

Physical hazards: Heat, cold, humidity, radiation.

Chemical hazards: Due to extensive use of chemicals in the form of fertilizer, insecticide, pesticide, etc., these can cause harm.

Biological hazards: Plants, animals and soil

Mechanical hazards: Accidents from the use of farming tools, overturning of tractors, workload, etc., can occur.

Social hazards: Cultural, educational, economic differences can influence the health of workers.

Miscellaneous hazards: Snake bite, scorpion bite, other traumatic injury.

Prevention and control of agricultural hazards:

- **Health promotion:** Working conditions should be tackled by working styles.
- **Specific protection:** Helmet, mask, etc., can directly prevent the effect of occupational hazards.
- **Early diagnosis and treatment:** It is very important for controlling all hazards.
- **Tertiary prevention:** Disability limitation and rehabilitation.

CM11.4: Describe the principles of ergonomics in health preservation.

Q3. What do you mean by occupational environment?

Ans: By "occupational environment" is meant the sum of the external conditions and influences which prevail at the place of work and which have a bearing on the health of the working population. Usually, there are three types of interaction in a working environment:

1. Man and physical, chemical and biological agents
2. Man and machine
3. Man and man

Q3a. What is ergonomics? *(WBUHS, 2011, 2023; SAMU, 2012, 2016; VKSUAB, 2018; YSRUHSAP, 2021; TDMGRMU, 2009, 2011; PBDSUHSH, 2013; SMU, 2013, 2015; NIMSUR, 2015; NU, 2014; MU, 2019, 2023; VNSGUS, 2023; GOAU, 2021, 2023; KIMS; 2024)*

Ans: It is a new and an integral concept of occupational health. **It is derived from Greek word 'ergon' meaning work and 'nomos' meaning law. It means fitting a particular job to a worker who can perform the job with comfort. It is the scientific study of people at work.**

Ergonomics can be defined as the training which involves designing of machines, tools, equipment and manufacturing processes, lay out of the places of work, methods of work and environment in order to achieve the best mutual adjustment of man and of his work for the improvement human efficiency and well-being of both man and machine.

Manual material handling (MMH) work contributes to a large percentage of the over half a million cases of musculoskeletal disorders reported annually in the United States. Musculoskeletal disorders often involve strains and sprains to the lower back, shoulders, and upper limbs. They can result in protracted pain, disability, medical treatment, and financial stress.

Scientific evidence shows that effective ergonomic interventions can lower the physical demands of MMH work tasks, thereby lowering the incidence and severity of the musculoskeletal injuries they can cause. Their potential for reducing injury-related costs alone makes ergonomic interventions a useful tool for improving a company's productivity, product quality, and overall business competitiveness.

CM11.2: Describe the role, benefits and functioning of the Employees' State Insurance Scheme.

Q4. Define factory under Indian Factories Act, 1948. Write in brief the provision recommended for in Indian Factories Act, 1948 to protect the health of the workers. *(WBUHS, 2015; ABKUB, 2022; YSRUHSAP, 2021, 2023)*

Ans: The Indian Factories Act, 1948 and amended on 1987: The factory may be defined as an establishment employing 10 or more workers where power is used and 20 or more workers where power is not used. Workers may be defined as per amendment in 1976 that all labors including contractual labors employed in the manufacturing process also recommended for **crèche** wherein 30 women workers are employed and for 500 or more workers, where should be a **Welfare Officer**.

Recommendation of the Factory Act on health, safety and welfare of the workers: Cleanliness, lighting and ventilation should be ensured along with treatment of wastes and their disposal, elimination of dusts and fumes, control of temperature, safe cool water supply for summer, provision of water in latrine and separate latrine and urinal for female workers to protect the workers from hazardous health and environment.

Safety measures like fencing of machines, protection of eyes by use of goggles, precautions against fire, dangerous fumes, etc., are defined and facilities of washing, resting and canteens.

There is provision for one weekly holiday and not more than 48 hours in a week for an adult worker. After a stretch of 5 hours of continuous work, there is provision for half an hour rest. No women should be employed between 7 PM and 6 AM. No child (more than 14 and less than 18 years) should work more than 4 hours a day and should not work in the night between 10 PM and 6 AM. One full wage leave should be given to an adult worker for every 20 days of work and one for 15 days to the child worker. Twelve weeks of maternity leave should be given to a women.

If an accident occurs in any factory causing death or bodily injury the manager immediately send notice to appropriate authority. Notifiable diseases should be notified to the labor department by factory medical officer.

Q4a. What is the eligibility criteria for enrolling in ESI scheme? Briefly mention the benefits under ESI scheme. *(WBUHS, 2016, 2019, 2021, 2023; BNMUB, 2013, 2018; RGUHS, 2006; SAMU, 2017; VKSUAB, 2019; PBDSUHSH, 2018, RUJH, 2018, 2021; SSUHSA, 2010, 2012; SMU, 2012, 2014; TRIU, 2016; TDMGRMU, 2012; ABKUB, 2010; NU, 2015; KIMS, 2019, 2023; AKUB, 2023; VNSGUS, 2023)*

Ans: Employees State Insurance Act passed in 1948 and amended in 1975, 1984, 1989 and 2010:
It covered initially all power using factories other than seasonal factories where in 10 or more persons are employed. The provisions of the ESI Act, 1975 were extended to the following classes of establishments:

- Small factories employing 10 or more persons, where power is used are covered.
- Shops, hotel and restaurants, cinemas and theaters, motor transport establishment and newspaper establishment are included.
- Extended to private medical and educational institutions employing 20 or more persons.

With effect from **25th May 2010**, the Act has given the coverage of all employees of manual, clerical, supervisory and technical staff getting up to ₹ 15,000 per month. The provision of the Act can be extended to any other agricultural or commercial establishment. From **1st January 2017,** it is further increased to ₹ 21,000 per month.

(VBUJH, 2022; MU, 2023)

Benefits under ESI scheme:

- Medical benefit.
- Sickness benefit.
- Maternity benefit.
- Disablement benefit.
- Dependent's benefit.
- Funeral expenses.
- Rehabilitation allowance.

Medical benefit: It consists of full medical care including hospitalization, free of cost to the insured person in case of sickness, employment injury, and maternity issue. The services comprise of the followings:

- Outpatient care
- Supply of drugs and dressings
- Specialist services in all branch of medicine
- Pathological and radiological investigation
- Domiciliary services
- Antenatal, natal and post natal services
- Family planning and immunization services
- Inpatient services, etc.
- Medical care is provided directly through the ESI hospitals and dispensaries or indirectly through a panel of private medical practitioners appointed as "Insurance Medical Practitioners".
- **Other medical facilities:**
  - Dentures, spectacles, hearing aids are provided free to the patients.
  - Artificial limbs are provided free to the patient.
  - Special appliances, such as hernia belt, walking calipers, spinal braces and jackets are provided as prescribed by specialists.

Sickness benefit: It consists of periodical cash payment to an insured person in case of sickness, if the sickness is duly certified by an insurance medical officer or insurance medical practitioner. The benefit is payable for a maximum period of 91 days, in any continuous period of 365 days, the daily rate being 70% of the average daily wages.

Extended sickness benefit: In addition to 91 days of sickness benefit, insured persons suffering from certain long-term diseases are entitled to extended sickness benefit. There are 34 diseases for which extended sickness benefit with effect from 1.1.2000 is payable like tuberculosis, leprosy, chronic emphysema, AIDS, malignant diseases, etc., in case where the insured person has been in continuous employment for 2 years.

Maternity benefit: The benefit is payable in cash, to an insured person for confinement/miscarriage or sickness arising out of pregnancy/confinement or premature birth of the child or miscarriage. For confinement, the duration of benefit is 26 weeks (newly decided), for miscarriage 6 weeks and for sickness arising out of confinement, etc., for 30 days.

Disablement benefit: The Act provides for cash payment, besides the medical treatment in the event of temporary or permanent disablement as a result of employment injury as well as occupational diseases. The rate of temporary disablement, benefit is about 70% of the wages as long as the temporary disablement lasts. In case of total permanent disablement, the insured person is given life pension worked out on the basis of loss of earning capacity determined by a medical board, while in case of partial permanent disablement, a portion of it is granted as a pension.

Dependent's benefit: In case of death, as a result of an employment injury, the dependent of an insured person are eligible for periodic payments. Pension at the rate of 70% of wages is payable, shared by dependents in a fixed ratio, on monthly basis in accordance with the prescribed share. An eligible son or daughter is entitled to dependent's benefit up to the age of 18 years; the benefit is withdrawn if the daughter marries earlier.

Funeral expenses: Funeral benefit is a cash payment payable on the death of an insured person towards the expanses on his funeral, the amount not exceeding ₹ 15, 000/=

Rehabilitation: On monthly payment of ₹ 10, the insured person and his family members continue to get medical treatment after permanent disablement or retirement.

Q5. In an accident in a factory, a male worker lost his lower limb below thigh. Enumerate the benefits he is entitled to under ESI Act. In case of death of the worker, what are the benefits his family is entitled to get? What are the steps to be taken from the management to prevent future occurrence of any such event? *(WBUHS, 2019; TRIU, 2023)*

Ans: Benefits of a male worker who lost his lower limb below thigh are entitled to under ESI Act:

A. In case of temporary disability, 85% of the wage will be given till his/her recovery.

B. In permanent disability, the pension is given in full rate throughout the life.

C. Medical treatment will be available to self and family members after a small monthly payment.

The Employees' State Insurance (ESI) Scheme under the ESI, Act, 1948 provides social security coverage to workers employed in various factories and establishments, and covers contingencies, such as sickness, maternity leave, and physical disablement or death due to employment injury resulting in loss of wages or earning capacity.

- **Permanent disablement benefit (PDB) rate:** The PDB rate is calculated as percentage of loss of earning capacity as assessed by the Medical Board/MAT/EI Court in relation to Temporary Disablement Benefit **(TDB)**. PDB amount is revised by the ESIC from time to time to adjust for inflation. The latest enhancement is with effect from 01.08.2009.
- **Commutation of PDB (Regulation 76-B):** PDB has been assessed as final and who has been awarded the same at the rate not exceeding ₹ 1.50 per day may apply for commutation of periodical payments of PDB into a lump-sum. When an application for commutation is made within 6 months of the date of communication of Medical Board decision periodical payments shall be commuted into a lump sum provided the total commuted value does not exceed ₹ 10,000/- at the time of commencement of final award.
- **Age proof** of an Insured Person **(IP)** will have to be proved to the satisfaction of the corporation in all cases.
- **In case of death of the worker,** the benefits his family is entitled to get will be as follows: Dependent's benefit and funeral benefit as per existing rules.

The steps to be taken from the management to prevent future occurrence of any such event:

1. Preplacement examination of workers should be a routine job of industry.
2. Adequate job training is an essential requirement of industrial workers. This is an important step to reduce most of accidents.
3. Regular educational program after a certain interval or after launching a new production unit or new program.
4. The industrial authority will ensure safe environment for the work in any unit of industry.
5. The industry should establish a department for health, safety and welfare for the workers.
6. Survey for finding out the hazards in the industry should be regularly done.
7. Report should be prepared by the safety officers after each survey and it should be made ready for public reading, awareness and compliance.

If all these rules are followed properly in any industry, industrial accident like leg amputation can be prevented in future.

Q5a. In ESI scheme, employers are also benefited-explain *(AKUB. 2023)*

Ans. Employers benefits are given below:

a. Exemption from applicability of workmen's Compensation Act' 1961
b. Exemption from Maternity Benefit Act 1961
c. Exemption from payment of medical allowance to employees and their dependents or arranging for their medical care
d. Rebate under Income Tax Act on contribution deposited in the ESI account
e. Healthy work force

CM11.5: Describe occupational disorders of health professionals and their prevention and management.

Q6. Describe occupational disorders of health professionals and their prevention and management. *(AKUB. 2023)*

Ans: COVID-19 has taken away many lives of health professionals/healthcare workers in India and abroad. Nosocomial or hospital acquired infections accounts for 1.7 million infections and 99,000 deaths in India every year.

Health professional accounts for following risks of acquiring and transmission of diseases from and to patients respectively.

- Needle sticks injuries and handling of HIV positives, leading to hepatitis B, C and HIV infection
- Handling of open cases of tuberculosis without adequate protection may exposed to tuberculosis
- Radiation hazards to radiologists and radiotherapists
- Hazards of infection during outbreak investigations like Zika, SARS, Swine flu, Ebola, Plague, Nipah and Coronavirus disease.
- Organophosphate poisoning in spray workers
- Chemical hazards—chemicals used by health workers may cause corrosive effects on skin, irritation on eye, respiratory infections.

Types of hazards from hospital waste:

- Infection
- Chemical toxicity
- Genotoxicity
- Cytotoxicity
- Radioactive hazards
- Physical injuries from sharps and chemicals

Prevention: By observing universal practices health risks could be reduced:

- Handwashing
- Personal protective equipment
- Masks and gloves
- Safe disposal of hospital wastes
- Maintaining barrier
- Immunization against tetanus, hepatitis B and COVID-19
- Exposure to body fluid, blood and blood products

Hospital design:

- Ventilation
- Isolation wards

SHORT NOTES AND RELEVANT QUESTIONS

Q7. What is respirable dust? *(RGUHS, 2003)*

Ans: Dusts are very small (0.1–150 microns) solid particles present in the environment. These dusts are coming in the atmosphere from different kinds of physical activities. The common industries where dusts are produced are stone crushing machines, quarries, mines, potteries, textiles, etc., 10–150 microns size particles are generally settled down on the ground. 5–10 microns particles float in the air and these may enter into the respiratory passage but arrested by the respiratory protective or defense mechanism (ciliated mucus membrane, mucus secreted by the goblet cells, ciliary expulsive movement, etc.).

Respirable dust comprises the dust particles smaller than 5 microns. These dust particles are directly inhaled into lungs and are retained there; they are most dangerous of all dust particles.

Q8. Describe diagnosis, prevention and control of inorganic lead poisoning.
(BNMUB, 2010; ABKUB, 2018; VBUJH, 2023)

Ans: It is the most common toxic metal poisoning occurring in the industries, as a silent epidemic, because of its wide usage.

Diagnosis:

1. History of (H/o) of occupational exposure to lead
2. **Clinical symptoms:** Anemia, colicky pain abdomen, diarrhea, encephalopathy, fatigue, headache, insomnia, joint pain, wrist drop, etc.)

3. **Laboratory investigation:**
   - Hemoglobin percentage, peripheral smear, RBC count, reticulocyte count, basophilic stippling
   - Assessment of blood level of lead, urinary level of lead, coproporphyrin and aminolevulinic acid in urine.

Prevention of lead poisoning *(SAMU, 2016; MGUB, 2020)*

Primary protection through health promotion:

- **Preplacement examination:** This is done through thorough history, clinical examination and laboratory investigation. It is done to assess the physical and psychological capacity of the worker.
- **Improvement of sanitation:** Good house-keeping, ventilation.
- **Control of dust** through wet drilling or special enclosure system with hood and duct
- **Health education:** Workers should be adequately educated about the hazards of exposure to lead and importance of using personal protective devices.
- **Substitution:** Harmful lead oxide should be replaced by titanium oxide.
- **Specific protection:** By use of gloves among painters and use of respirators and masks.
- **Early diagnosis and treatment:** Periodical examination and treatment through history, clinical examination and laboratory investigation and detect the disease at early stage and treatment with chelating agent EDTA.

Tertiary prevention:

- **Disability limitation:** It can be prevented giving treatment followed by substitution
- **Rehabilitation:** For wrist drop or neurological deficit followed by lead encephalopathy.

Q9. Describe health insurance scheme. *(WBUHS, 2012)*

Ans: This is a complex mechanism of financing health care. The revenue is generated either by individuals paying a premium or by employers contributing towards their employees or even the government paying on behalf of the poor. This revenue (called premium) is pooled into an autonomous fund that is used specifically to finance health care. The different types of health insurance schemes are given below:

- Voluntary health insurance scheme, such as Life Insurance Corporation (LIC), Bajaj Alliance, ICICI, etc.
- **Employer-based scheme:** Railway, defense, security forces, plantation sector, mining sector, etc. Services benefits are provided to his own employees.
- **Insurance offered by NGO/community-based health insurance:** Self-Employed Women's Association (SEWA), Amul Dairy Cooperatives in Gujarat.
- **Mandatory health insurance scheme:** Central Government Health Scheme (CGHS), ESI.
- Rashtriya Swasthya Bima Yojana (RSBY)

Q10. Describe thermal indices comfort. *(BNMUB, 2010; ABKUB, 2006, 2008)*

Ans: Thermal comfort is a complex entity. Much work was done to determine what constitutes thermal comfort. Thermal indices are as follows:

- **Air temperature:** It was used once upon a time, but now-a-days, air temperature alone is not an adequate index of thermal comfort.
- **Air temperature and humidity:** Air temperature and humidity were considered together to express thermal comfort, even this was found to be unsatisfactory.
- **Cooling power:** Later, it was told that air temperature, humidity, air movements were considered together to express as cooling power.
- **Effective temperature:** Effective temperature is an arbitrary index, which combines into a single value the effect of temperature, humidity and movement of the internal air on the sensation of warmth or cold felt by the human body.
- **Corrected effective temperature:** The index is an improvement over effective temperature index. That is the CET scale deals with four factors, namely air temperature, velocity, humidity and mean radiant heat.

- **Maximum allowable sweat rate:** McArdle and associates took 4.5 liters of sweat excreted in 4 hours as the maximum allowable sweat rate compatible with physiological repeated exposures to heat.

Q11. What are the problems of industrialization? Suggest measure to improve them. *(WBUHS, 2008; RGUHS, 2010, 2013, 2024; SAMU, 2008; TDMGRMU, 2011; BNMUB, 2021; GOAU, 2023)*

Ans: The community health problems arising out of industrialization are discussed below:

A. **Environmental sanitation problems:**
- *Housing:* A rise in the number of slums and insanitary dwellings is one of the chief problems in all industrial areas due to migration of the people from the country side for employment.
- *Water pollution:* It is one of the tragic effects of rapid industrialization due to discharge of industrial wastes without treatment.
- *Air pollution:* It is due to discharge of toxic fumes, gases, smoke and dusts into the atmosphere.
- *Sewage disposal:* Lack of facilities for the disposal of sewage leads to pollution of water supply, contamination of soil with parasites and their ova.

B. **Communicable diseases** like tuberculosis, venereal diseases (STI), food and water-borne infections and in industrial area filariasis are other problem.

C. **Food sanitation:** The standards of food sanitation are bound to be lowered due to industrialization, if precautions are not taken. Food-borne infections, such as typhoid fever and viral hepatitis are common in India.

D. **Mental health problems:** People are removed from the warmth of village community life and are transplanted in an alien environment which calls for certain adjustment. Failure of adjustment leads to mental illness, psychoneurosis, behavioral disorder, delinquency, etc.

E. **Social problems:** Alcoholism, drug addiction, gambling, prostitution, increased divorces, breaking up of home, juvenile delinquency, etc.

F. **Accidents** are common due to congestion, vehicular traffic and increased tempo of life.

G. **Increased morbidity and mortality from certain diseases** like lung cancer and chronic bronchitis.

Suggest measure for improvement:
- Nutrition
- Communicable disease control
- Environmental sanitation
- Mental health
- Measure for women and children
- Health education
- Family planning

Q12. Sickness absenteeism. *(WBUHS, 2014, 2021; BNMUB, 2014; VKSUAB, 2019; PBDSUHSH, 2017; RGUHS, 2015, 2024; MGUB, 2023; 2024; YSRUHSAP, 2020; TDMGRMU, 2012, 2014; SSUHSA, 2008; DU, 2012; VBUJH, 2023; TRIU, 2024)*

Sickness absenteeism do not give actual estimate of morbidity pattern of an industry. *(WBUHS, 2017)*

Ans: Sickness absence is an important health problem in industry. Both directly and indirectly, it may seriously impede production with serious cost repercussions. When the production technique more sophisticated, absenteeism tends to increase the adverse repercussions. It is an important index in industry to assess the state of health workers, and their physical, mental and social well-being.

Incidence: India has a working force of 5 million in registered factories. Research undertaken by the National Productivity Council (NPC) into absenteeism showed a marked increase from around 8 to 13% in early 1950' to around 15 to 20% or even more in recent years. The rate of absenteeism was reported to be 8–10 days per head per year.

Causes: (influencing factors)

A. **Medical causes:** About 10% days were lost due to occupational accidents. Apart from this, respiratory and alimentary problems were found mostly.

B. **Economic causes:** Since the workers are entitled to sickness benefit (sick leave with pay), he/she wants to avail this benefit of cash by declaring himself/herself unfit for work should be certified by the Insurance Medical Officer, worker get yearly benefit.

C. **Host factors:**

- *Age:* Sickness absenteeism increases as the age advances.
- *Sex:* Women workers have frequent absents and male have longer absences. As the majority of women works are married and having children, they absent from jobs due to their home responsibilities.
- *Marital status:* Sickness absenteeism is more among married workers than unmarried.
- *Season:* More in winter than other season because of frequent respiratory tract infections.
- *Social:* Social and family obligations, such as weddings, festivals, repair and maintenance of ancestral house and similar other causes. Some of the workers come from long distance. During sowing and harvest seasons, these play their role.
- *Nonoccupational causes:* Nutritional disorder, alcoholism and drug addiction, etc.

Prevention: Reduction of sickness absenteeism would result in better utilization of resources and maximizing the production. The methods of reducing sickness absenteeism includes:

- Preplacement examination through application of ergonomics
- Good factory management including recreational activities and incentives
- Good human relationships between management and employees
- Proper treatment facilities
- Elimination of stressful conditions

Q13. Describe about child labor. *(WBUHS, 2012; RUJH, 2023)*

Ans: Child labor is a major social problem in developing countries like India. If a child aged 14 years or below is engaged in any work, is considered to be a child labor. A significant number of growing children of poor socioeconomic class especially in rural areas are known to be inducted as child labor. According to the surveys by International Labor Organization (ILO), forced child labor is present in all regions and kinds of economy. Children in domestic services are most invisible labors. Many of these children are girls, and in many countries domestic service is seen as the only avenue employment for young girls. Besides the domestic job, many children are working in various harmful factories, industries, etc., which affects the both physical and mental health of the child. Another form of forced labor is debt bondage, whatever the origin of the debt, it leaves children under complete control of a money lender in a state little distinguishable from slavery. India fosters the largest number of child labor in the world. Child labor contributes about 20% of India's GNP. Child workers work for 12 hours at an average every day.

In India, various items of health and social legislations have been enacted to protect the health, safety and welfare of working children below the age of 15 years. One of the important legislation is the Child labor (Prohibition and Regulation) Act, 1986.

Q14. Describe occupational cancer (causes and types) and its prevention. *(WBUHS, 2018; AKUB, 2022; ABKUB, 2009; GNSUB, 2022; GITAMAP, 2023; RGUHS, 2012, 2013, 2024; TDMGRMU, 2013, 2014; DU, 2007; GOAU, 2020)*

Ans: Occupational cancers are serious medical and health problems in persons occupied in industry. They are different from cancer in general population.

Characteristics:

- Particular type of cancer is specific to a specific occupation.
- They appear pretty long after the exposure, may be 20-25 years.
- They appear irrespective of continuation or cessation of exposure.

- The early diagnosis through detection of precancerous lesion is possible, hence could be preventable.
- Occupational carcinogens can affect even the population residing near industrial areas through air and water pollution.
- The most commonly affected organs are lung, skin, bladder and blood forming organs.

A. **Skin cancer:**
- Skin cancer is the most common of all occupational cancers (about 75%).
- Predominant type is squamous cell carcinoma.
- It commonly occurs in the exposed part of the body.
- Carcinogens incriminated include UV light, ionizing radiation, coal products, petroleum products, fuel oils, etc.
- The common sites are near hand cuffs, arm cuffs, neck, thigh above the knee and in between thigh.
- The workers with precancerous conditions (eczema, cracks and fissures on skin) are predisposing conditions for development of cancer.

B. **Bladder cancer:**
- Due to increase use of chemicals, the incidence of bladder cancer is rising.
- The chemicals like aniline, naphthylamine, benzidine, benzpyrene are metabolized in the body and excreted in urine.
- They are commonly seen in rubber, shoe, textile, gas, dyes, paints, plastics and synthetic polymer industries.
- Early manifestation is painless hematuria.
- Most common type is transitional cell carcinoma (90%).

C. **Lung cancer:**
- The respiratory passage from lung to alveoli may affected by physical or chemical carcinogens in different industries.
- In the area with high air pollution, more prevalence of tobacco smoking and repeated attack of respiratory infections are common.
- Squamous cell carcinoma of bronchus is the most common variety.
- In furniture workers, nasal cancers are common.
- Carcinoma bronchus is common in industries using or manufacturing chromium, nickel, arsenic, aluminum, asbestos, etc.
- Lung cancer is also common in industries of mining hematite or uranium.

D. **Other cancers:** Leukemia and bone cancers are common with ionizing radiations in mines, industrial and medical uses of radioactive energy, radium paints, benzene, vinyl chloride or rubber industry. Radiological exposure to health workers may cause similar medical problems.

Steps for prevention of occupational cancer *(WBUHS, 2017; ABKUB, 2012; SMU, 2013; NU, 2017)*

The control measure comprises the following:
- Elimination or control of industrial carcinogens. Technical measures like exclusion of the carcinogen from the industry, well-designed building or machinery, closed system of production, etc.
- Medical examination
- Inspections of factories
- Notification
- Licensing of establishments
- Personal hygiene measures
- Education of the workers and management on industrial health

Q15. Causes and preventive measures for occupational dermatitis *(AKUB, 2024)*

Ans: Occupational dermatitis is a big health problem in many industries. The causes of it:

A. Physical—heat, cold, moisture, friction, pressure, X-ray and other ways, etc.

B. Chemical—acids, alkalies, dyes, solvents, grease, tar, pitch, chlorinated phenols, etc.

C. Biological—bacteria, virus, fungi and other parasites
D. Plant products—leaves, vegetables and its dust, fruits, flowers, etc.

Prevention:

It is largely preventable if proper control measures are adopted:

A. Preselection: The workers should be medically examined before employment, and those who with an established or suspected dermatitis should be kept away from jobs.
B. Protection: The workers be protected against direct contact by protective clothing, long leather gloves, aprons, and boots.
C. Personal hygiene: Availability of plentiful supply of warm water, soap and towels, workers should be encouraged and educated to make frequent use of these facilities.
Adequate washing facilities in industry are a statutory obligation under the Factories Act.
D. Periodic inspection: It is important to note that periodic medical check-up of all workers are extremely important for early detection and treatment of occupational dermatitis. If necessary, the affected worker may be transferred to other department where risk is minimum or almost nil.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. Under Indian Factories Act, 1948 minimum cubic space allotted to each worker: *(AKUB, 2022)*
a. 450 b. 500 c. 750 d. 1000

2. Occupational hazards include all of the following, *except:* *(TRIU, 2023)*
a. Physical hazard
b. Chemical hazard
c. Biological hazard
d. Environmental hazard

3. Silicosis occurs with: *(ABKUB, 2018; AFUH, 2022)*
a. Cotton b. Sugarcane c. Carbon particles d. Silica

4. Silicosis is associated with: *(SAMU, 2015)*
a. Leprosy b. Tuberculosis c. HIV infection d. Myocardial infraction

5. An industrial worker reported to you with complaints of cough, history of dyspnea on exertion and pain in the chest. His X-ray chest showed snow storm appearance. The diagnosis would be: *(ABKUB, 2020)*
a. Asbestosis b. Siderosis c. Silicosis d. Aspergillosis

6. An industrial worker presented with pulmonary tuberculosis. On X-ray, calcification and fibrosis were seen. The likely industry he had worked in is: *(ABKUB, 2020)*
a. Sand blasting b. Poultry c. Cotton d. Agriculture

7. Byssinosis is seen in: *(KIMS, 2017)*
a. Cement factories b. Textile industries c. Iron factories d. Granite fields

8. Bagassosis, an interstitial lung disease, caused by: *(AKUB, 2020)*
a. Jute dust
b. Cotton dust or residue
c. Coconut dust or residue
d. Cane-sugar dust or residue
e. Mouldy hay or grain dust

9. Bagassosis is a consequence of pneumoconiosis caused prolonged/long-term inhalation of: *(WBUHS, 2023; ABKUB, 2023; TRIU, 2023; SSUHSA, 2023)*
a. Cotton dust b. Sugarcane dust c. Silica dust d. Coal dust *(ABKUB, 2017)*

10. Periodic examination of factory workers is a type of:
a. Primordial prevention
b. Primary prevention
c. Secondary prevention
d. Tertiary prevention

Occupational leukemia usually occurs in workers of: *(BNMUB, 2006)*
a. Coal miners
b. Dye industry
c. Nuclear energy industry
d. Farm machinery

ESI scheme was first introduced in: *(ABKUB, 2003)*
a. Delhi
b. Mumbai
c. Kanpur
d. Kolkata

Extended sickness benefit is given for how many days? *(ABKUB, 2021)*
a. 91 days
b. 2 years
c. 14 days
d. 30 days

Diseases for which extended sickness benefit is payable for 124 days? *(BNMUB, 2005)*
a. Tuberculosis
b. Myocardial infarction
c. Mental diseases
d. Chronic congestive cardiac failure

The most common mode of lead poisoning is: *(ABKUB, 2018)*
a. Injection
b. Dermally
c. Inhalation
d. Fecal-oral

Sickness absenteeism is a useful index in industry is to assess: *(VKSUAB, 2021)*
a. State of worker's health
b. Worker's management relationship
c. Working environment
d. Sincerity of workers

The occupational hazard that causes white fingers among industrial workers is: *(YSRUHSAP, 2023)*
a. Cold
b. Heat
c. Vibration
d. Radiation

Ergonomics is concerned with: *(MGUB, 2023, 2024)*
a. Improving the genetic endowment of human population
b. Fitting the job to the worker
c. Environmental manipulation according to the human needs
d. Improving the agricultural productions

Inhalation of cotton fiber dust for a long period of time leads/causes to: *(RUJH, 2023; GOAU, 2023)*
a. Byssinosis
b. Bagassosis
c. Anthracosis
d. Siderosis
e. Farmer's lung

Which of the following is a known respirable dust? *(AFUH, 2023)*
a. Dust particle 5–10 microns
b. Dust particle <5 microns
c. Dust particle <3 microns
d. Dust particle <0.5 microns

"Monday chest tightness" is associated with: *(WBUHS, 2024)*
a. Bagassosis
b. Byssinosis
c. Asbestosis
d. Silicosis

Byssinosis is due to long-term inhalation of: *(TRIU, 2024)*
a. Sugarcane dust
b. Cotton dust
c. Silica dust
d. Benzene fumes

Which type of workers in cotton industry, are commonly affected in byssinosis? *(MGUB, 2024)*
a. Growers
b. Spinners
c. Weavers
d. Dyers

Farmer's lung results from: *(KIMS, 2019)*
a. Sugercane dust
b. Cotton fiber dust
c. Grain dust
d. Tobacco

Ergonomics is: *(TRIU, 2023, 2024; SSUHSA, 2024)*
a. Adjusting the worker to his job
b. Study of human behaviors
c. Study of social mobility
d. Study of health of female workers

26. Study of designing equipment and devices that fit the human body, its movements, and its cognitive abilities is:
a. Economics b. Ergonomics c. Bionomics d. Sociomatics

27. In the mica mines of Bihar, out of 329 miners examined, 34.1% were found suffering with irritant cough, dyspnea on exertion and pain in the chest. On chest X-ray, there was "Snow-storm" appearance in the lung fields. What is the most likely diagnosis?
a. Asbestosis
b. Anthracosis
c. Siderosis
d. Silicosis
e. Tobaccosis

28. The Factories Act, 1976 defines factory as an establishment employing:
a. 10 or more workers where power is used
b. 30 or more workers where power is not used
c. 20 or more workers where power is used
d. Only skilled workers

29. Maternity benefit allowed under the ESI act is:
a. 7/12 of days wages b. Half wages c. Quarter wages d. Full wages

30. The benefits of ESI Act includes the following, *except*:
a. Medical benefits
b. Rehabilitation allowances
c. Sickness benefits
d. Nutritional allowances

Answers:

1.	b	**2.**	d	**3.**	d	**4.**	b	**5.**	c	**6.**	a	**7.**	b	**8.**	d	**9.**	b	**10.**	b
11.	c	**12.**	c	**13.**	a	**14.**	a	**15.**	c	**16.**	a	**17.**	c	**18.**	b	**19.**	a	**20.**	b
21.	b	**22.**	b	**23.**	c	**24.**	c	**25.**	a	**26.**	b	**27.**	d	**28.**	a	**29.**	d	**30.**	d

FILL IN THE BLANKS

1. Pneumoconiosis is caused by exposure to dust particle of size range _____ microns.
2. Byssinosis is due to inhalation of _____.
3. Name of the disease caused by long-term inhalation of cotton dust is called _____.
4. Sickness benefit under ESI Act is payable for a maximum period of _____ days in any continuous period of 365 days [7/61/91/31].
5. Acceptable noise level in hospital ward is _____.
6. Daily exposure up to _____ dB is about the limit people can tolerate without damage to their hearing.

Answers:

1. 0.5 to 3 (Three)
2. Cotton fiber dust
3. Byssinosis
4. 91
5. 20–35 dB
6. 85

PTER
12

Geriatric Health

M12.1: Define and describe the concept of geriatric services.

e word **'geriatrics'** is derived from the Greek words ***gera*** and ***iatros lightface,*** which mean old age and treatment, pectively. Butterworths Medical Dictionary has given the following definition, **"clinical study and treatment old age and its manifestation"**. Geriatrics or geriatric medicine is now a well-recognized medical discipline in veloped countries and also in India.

Gerontology is the science, which studies the process of aging and describes physiological, biochemical and chological changes during the aging process.

The life expectancy has increased to about 69 years in 2018 from 32 years in 1951, due to socioeconomic velopment in India. Thus, we have added 37 years to longevity of life, and it is going to increase further in coming ars.

Demographic changes in India have resulted in change in structure of population. The population of 60 years nd above 8.6% in 2011 has risen to 10% by the year 2021. In absolute number, the above population was about 140 illion in 2019, will rise to nearly 198 million by 2030, and about 319 million by 2050.

M12.2: Describe health problems of aged population.

Q1. What are the health problems of geriatric population?

(WBUHS, 2015, 2022; MGUB, 2022, 2024; BNMUB, 2011; ABKUB, 2019; YSRUHSAP, 2020; RGUHS, 2013, 2015, 2024; TRIU, 2016, 2023; SSUHSA, 2015, 2017, 2021, 2022, 2023; SAMU, 2012, 2022; TDMGRMU, 2011, 2013; KIMS, 2014, 2015, 2019; DU, 2013; SMU, 2014, 2012; NU, 2015, 2016; SDVPG, 2023; GOAU, 2021; AKUB, 2024; VNSGUS, 2023)

Ans: The geriatric population comprises a significant proportion of total population. The aging process includes degeneration of organ tissue and cells, degradation of organ activities after reaching 60 years, even before that age, failure of regeneration and repair in the way a young can do, accident, impaired body function, etc. Different types of health problems are faced by this population, which are listed below.

A. Problems due to the aging process:

- Senile cataract
- Glaucoma
- Nerve deafness
- Osteoporosis affecting mobility
- Emphysema
- Failure of special senses
- Change in mental outlook

B. Problems associated with long-term illness:

- *Degenerative disease of heart and blood vessels:* No single factor has been identified in the cause of atherosclerosis. Diet, heredity, overweight, emotional strains have all been implicated.
- *Cancer:* It is one of the leading causes of death in this age group.
- *Accidents:* These are common health problems of elderly. Bones become fragile as a result of decalcification, so fracture neck femur is common in geriatric population.

- Diabetes and its related complications.
- *Diseases of the locomotor system:* Fibrositis, myositis, gout, rheumatoid arthritis, osteoarthritis, spondylitis of the spine, etc.
- *Respiratory illness:* Chronic bronchitis, emphysema, asthma.
- *Genitourinary system:* Enlargement of the prostate, dysuria, nocturia, frequency and urgency of maturation.

C. Psychological problem:

- *Mental changes:* Impairment of memory, rigidity of outlook, dislike of changes.
- Sexual adjustment.
- Emotional disorders.

CM12.3: Describe the prevention of health problems of aged population.

Q2. Prevention of health problems of aged population. *(WBUHS, 2022)*

Ans: Primordial prevention: It begins during childhood period, i.e., shaping healthy lifestyles during early years of life. Primordial prevention focuses on prevention of emergence and establishment of above-mentioned risk factors by intervention of education and legislative measures. The main concept of this principle of active aging is to promote better health and well-being of older people.

Action towards active aging:

Factors	*Individual action*	*Policy action*
Fetal environment	Ensure balanced nutrition in girls and pregnant, lactating women	Awareness about nutrition for girls and women, promote exclusive breastfeeding (EBF)
Childhood environment	EBF for at least 6 months. Child immunization and food hygiene to prevent infection	Access to immunization program, improve sanitation and reduce over-crowding
Smoking	Stop smoking-cessation is beneficial at any age	Ban sale of tobacco to children
Alcohol	Maintain moderate drinking limit	Ban sale of alcohol to children
Physical activity	Regular exercise from earliest years and continue like walking, climbing stairs, household work, etc.	Incorporate exercise in school curriculum. Encourage sports for seniors
Diet	It should be high in fiber, low in animal fat and salt	Increase consumer awareness
Adult diseases	Make use of available prevention programs	Access to maternity service, accessible healthcare facility
Social integration	Involved in family, community, clubs and religious organizations	Provide access to lifelong learning
Gender	Speak out against gender discrimination and prejudice	Implement legislation against gender discrimination in education, jobs, health care, property rights, marriage, etc.
Income security	Be informed about income security	Promote income security

Primary prevention through health promotion:

Factors	*Implement for improvement*
Lifestyles	Tobacco, alcohol, drug abuse, physical inactivity and faulty diets lead to many lifestyle diseases. Healthy lifestyles like regular exercise and a good diet, improve health
Breathing exercises	Deep breathing helps to achieve relaxation and relieves stress

Contd...

Contd...

Factors	Implement for improvement
Diet and nutrition	The requirement of calories for elderly persons is 25% less than those of normal adults doing sedentary work. The calorie requirement of the elderly male is 1,800 kcal and female 1,400 kcal (ICMR RDA, 1995). Malnutrition in elderly is common because of loss of teeth, appetite and lack of care. Calorie restriction is an antiaging measure. Protein intake of 50–60 g per day is recommended for female and male respectively. Cooking fat (visible fat) should not be more than 15–20 g per day. One should make a balance of PUFA, MUFA and SFA. Two or more oils should be mixed of different composition. A good choice is an equal mixture of PUFA rich sunflower, sunflower or corn oil, with MUFA rich groundnut oil. Mustard oil is not a good choice as sole cooking medium. Sesame (Til) oil is also good as it contains nearly equal amount of PUFA and MUFA. Encourage whole grain cereals, fruits, vegetables, salads and spices (onion, turmeric, etc.), consumption of dietary fiber to avoid constipation and also used as cholesterol lowering agents.

Specific protection: Currently there is no program for immunization of elderly persons. They are vulnerable to tetanus, herpes zoster, pneumococcal, meningococcal, hepatitis and hepatitis B infections. They need to be protected with available vaccines.

Secondary prevention: Early diagnosis and treatment: Attempt should be made to detect the disease process in older people at the earliest to ensure prompt treatment. This can be achieved by screening of elderly or periodical check-ups of older people. Several attempts have been made by professional bodies (IMA) and voluntary organizations to organize free check-ups for noncommunicable diseases like diabetes mellitus, hypertension, heart diseases and cancer. Detection of cervical through Pap smears and self-examination of breast helps early detection of cancer. The national program for prevention of blindness provides free operation facilities through organized camps, free IOL and glasses are provided. Free sputum examination and treatment facilities are made available under NTEP.

Accidents: Falls of elderly people are common. Due to advancement of age, osteoporosis, fracture of neck femur and other bones are common. These accidents could be avoided by using nonslip tiles, mats on floors, by adequate lighting and using proper toilet facilities.

Oral health: Poor oral health and hygiene is a major problem for elderly persons. Above the age of 65 years 19% are edentulous, 80% had partial, 3% had intact teeth and only 1.5% were using dentures. The objectives of the national oral health policy seek to reduce the prevalence of edentulousness to 50% above the age of 65 years.

Alzheimer's disease (AD): It is also called primary degenerative dementia or degenerative brain syndrome. AD leads to a decline in memory, thinking, comprehension, language and learning capacity and judgement.

Tertiary prevention: Ensuring rehabilitation is the important aspect in this level of prevention. Most of the elderly person (85%) became active between 60 and 75 years only 15% having physical disabilities.

Most of these problems are managed at family level and with self-support and also support of primary and secondary healthcare institutions. Rehabilitation may be required for 1–2% of severe disabilities.

About 86% of elderly persons in rural and urban areas are staying with joint families. So, Government and NGOs should support the family sustainability. Family ensures social security, economic security and emotional security.

National policy for aged recognizes the value of family institution and sensitizes the younger population on necessity and desirability of intergenerational bonding and community.

The joint family system is shrinking because of nuclear families and only one or two children being born to family, hence creating problem for security of the elderly population.

QN12.4: Describe national program for elderly.

Q3. Describe objective of national program for elderly.

Ans: Objectives:

- To provide easy access to comprehensive health care (promotive, preventive, curative and rehabilitative) services for elderly people through a community-based primary health care approach.

- To promote the concept of active aging and healthy aging
- Other objectives are—strengthen referral system, to develop specialized manpower by training and to promote research in geriatrics and gerontology.

Q4. Discuss the core strategies of the National Program for Health Care of Elderly (NPHCE).

(ABKUB, 2016; DU, 2016; TRU, 2020)

Ans: Core strategies of the National Program for Health Care of Elderly (NPHCE) are:

- Community-based primary health care approach, including domiciliary visits by trained health care workers (ANMs, male health workers and nurses)
- Dedicated services at PHC/CHC level including provision of machinery, equipment, training, additional human resources (CHC) as well as IEC, etc.
- Dedicated facilities (geriatric unit) at District Hospitals with 10 bedded wards, additional human resources, machinery and equipment, consumables and drugs, training and IEC.
- Department of geriatrics at 20 super-specialized institutions expected to be developed at 20 medical institutions with 30-bedded inpatients facility for referral treatment, research and training. These institutions will be developed as regional geriatric centers (RGCs) and introducing PG courses in Geriatric Medicine, and in-service training of health personnel at all levels.
- The tertiary component of the program has been renamed as *Rashtriya Varishth Jan Swasthya Yojana* in 2016-17.
- In addition, two national centers of aging (NCAs) have been established at AIIMS, New Delhi, and Madras Medical College, Chennai with 20-bedded facility.
- Information, education and communication (IEC) using mass media, folk media and other communication channels to reach out to the target community
- Continuous monitoring and independent evaluation of the program and research in geriatrics and implementation of NPHCE.

Supplementary strategies include:

- Promotion of public-private partnerships in geriatric healthcare
- Mainstreaming AYUSH- revitalizing local health traditions, and convergence with programs of Ministry of Social Justice and Empowerment in the field of geriatrics.
- Reorientation of medical education to support geriatric issues, including geriatric care in the syllabus of medical and nursing courses.

Package of services available at different levels under NPHCE:

Health facility	Package of services
Subcenter (SC)	Health education is related to healthy aging Domiciliary visits by MPHWs for attention and care to home bedridden elderly persons and provide training to family care providers in looking after disabled elderly persons and link with other support groups
Primary Health Center (PHC)	Weekly geriatric clinic run by a trained medical officer Routine health assessment of the elderly persons like BP, blood sugar Referral for diseases needing further investigation
Community Health Center (CHC)	CHC will be first referral unit (FRU) for elderly patients from PHC/SC Geriatric clinic for elderly persons twice a week
District Geriatric Unit	Daily geriatric clinic for regular dedicated OPD services to elderly Facilities for laboratory investigations 10 bedded geriatric wards for inpatient care for elderly
Regional geriatric center	Geriatric clinic (OPD for elderly) 30 bedded geriatric wards for inpatient care for elderly Tertiary care for the patients referred from district hospitals and below Develop training modules and research on specific elderly diseases

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Commonest cause of blindness in old age is:**
   a. Refractive errors
   b. Cataract
   c. Diabetic retinopathy
   d. Glaucoma

2. **Concept of hospice related to:** *(AKUB, 2024)*
   a. Euthanasia for terminally ill patients
   b. Family health advisory service abandoned
   c. An association running orphanages for children
   d. Special group of people helping the old and terminally ill patients

3. **Elderly are at a risk of nutritional deficiencies because of:** *(DBRAUA, 2024)*
   a. Lack of financial resources to buy nutritious food items
   b. Reduced physical abilities with reduced ability to cook nutritious meals
   c. Orodental problems
   d. All of the above

Answers:

1. b **2.** d **3.** d

CHAPTER

13 Disaster Preparedness and Management

CM13.1: Define and describe the concept of disaster management.

Concept of disaster management: It is an emergency situation, **India 3rd is most disaster prone** in the world after United States of America and China. So far 4.8 million people have been affected by disasters in India while the number is likely to reach 19 million by 2030.

Q1. What is disaster? The common causes of disaster. What is disaster cycle? Enumerate the different health hazards likely to occur during and after flood/cyclone/waterborne diseases. As a BMOH, describe your preparedness to mitigate such hazards in future. *(WBUHS, 2012, 2015, 2017, 2018, 2020, 2023; AKUB, 2022, 2024; MGUB, 2022; ABKUB, 2018; VKSUAB, 2018; PBDSUHSH, 2017; SSUHSA, 2016, 2018; SMU, 2012, 2014; NU, 2013, 2015, 2016; RGUHS, 2013; TDMGRMU, 2015, 2016; DU, 2018; VBUJH, 2023; KIMS, 2023, 2024; BNMUB, 2023)***/Outline the management in relation to recent cyclone "Amphan" in West Bengal.** *(WBUHS, 2021)*

Ans: Disaster may be defined as **"Any occurrence that causes damage, ecological disruption, loss of human lives or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area."**

The common causes of disaster:

A. **Natural hazards:**

1. *Geophysical:*
   - Earthquake/mass movement of earth material
   - Tsunamis
   - Volcano
2. *Hydrological:*
   - Landslides—avalanches, debris flow, mud flow, rockfall
   - Flood—flash flood
   - Wave action—wind generated surface waves of water over oceans, rivers or lakes
3. *Meteorological:*
   - Cyclones, storm surge, tornado, convective storm, extratropical storm, high wind
   - Cold wave, derecho
   - Extreme temperature, fog, frost, freeze, heat wave
   - Lightning, heavy rain
   - Sand-storm, dust-storm
   - Snow, ice, winter storm
4. *Climatological:*
   - Drought
   - Extreme hot/cold conditions
   - Forest wildfire
   - Glacial lake outburst
   - Subsidence

5. *Biological:*
   - Epidemics: Viral, bacteria, parasitic, fungal infections
   - Insect infestations

B. **Human induces disasters:**

1. *Accidents:*
   - Vehicular (trains, buses, aircrafts, cars, bikes, etc.)
   - River and sea-drowning
   - Collapse of the buildings
   - Fires
   - Mine flooding
   - Oil spills
2. *Terrorist activities:*
   - Explosions
   - Serial bomb blasts
3. *Chemical:*
   - Toxic product from chemical plants
   - Warfare:
     - Biological—disease epidemics, cattle epidemics, pest attacks, food poisoning and COVID-19 pandemic.
     - Radiological—from research laboratories
     - Nuclear—from weapons production factories

General effects of disaster:

Sl. No.	General effects
1.	Loss of life
2.	Injury
3.	Damage to property/damage of cash
4.	Loss of livelihood
5.	Disruption of lifestyle/essential services
6.	Loss/disruption of infrastructure
7.	National/state economic loss
8.	Sociological/psychological aftereffects

Health effects of disaster:

Sl. No.	Health effects
1.	Accidents and trauma, loss of life and disposal of dead bodies
2.	Outbreak of diarrhea, cholera, hepatitis A and E, measles, pneumonia, acute respiratory infection (ARI)
3.	Vector borne diseases like malaria, dengue, chikungunya fever, Japanese encephalitis
4.	Problem of malnutrition, psychological trauma, problem of orphans

BMOH has to make a plan for preparedness to mitigate such hazards due to flood/cyclone in future.

Situation analysis: Evaluation of risk factors due to flood/cyclone affected area based on:

- Presence of dense forest
- History of rainfall on that area
- Low lying land
- Houses are located lower than land level, etc.

Assessment of likely health hazards during and after flood/cyclone

During flood:

- Loss of life

- Accident, traumatic injuries
- Psychological trauma

After flood:

- Spread of communicable diseases like diarrhea, cholera, food poisoning, hepatitis A, hepatitis E, malaria, dengue, acute respiratory infection (ARI), measles, meningitis, etc.
- Snake bite
- Malnutrition
- Deterioration of health service.

Preparedness plan to mitigate hazards due to disaster *(ABKUB, 2022)*/**Role of mitigation in Disaster Management** *(GNSUB, 2023)*

Disaster preparedness is a long-term development activity.

Goals: To strengthen the overall capacity and capability of that area/region to manage efficiently all types of emergencies.

Objectives:

- To ensure appropriate system and other resources (finance, manpower, logistics)
- To provide prompt effective assistance to disaster victims
- To facilitate relief measures and rehabilitation services

Components of preparedness plan:

A. **Organization of communication, information and warning system:** Availability of communication system is an essential part of disaster management. It will be required for transportation of victim, rescue workers, food, water, and other necessary materials. Adequate number of vehicles should be arranged beforehand and a comprehensive roadmap should be prepared. **For ensuring good information system, collaboration with telephone and postal department is necessary.** Good information system can ensure quick transmission of message to district level and other relevant departments.

B. **Involvement of community:** Community members, resources, organization, and administration should be the cornerstone of emergency preparedness program. The reasons of community preparedness are:
   - Members of the community mostly vulnerable to disasters and they must be aware of an effective and appropriate disaster preparedness program.
   - Those who first to respond to an emergency come from within the community. When transport and communication are disrupted, an external emergency response may not arrive for days.
   - Resources are most easily pooled at the community level and every community poses capabilities.
   - Sustained development is best achieved by allowing emergency affected communities to design, manage and implement external and internal assistance program.

C. **Adoption of measures to ensure financial and other resources:**
   Other resources include the followings:
   - ORS
   - Antimalarial drugs
   - Antibiotics
   - Zinc tablet
   - Insecticide
   - Spray equipment
   - Snake venom
   - Long lasting insecticidal bed net (LLIN)
   - Kits for water quality testing

D. **Development of public education program**: Group approach or mass media can be used for health education. Doctor, BPHN, PHN, staff of disaster management department can perform as health educator.

E. **Training of different categories of staff:** Organize disaster stimulation exercise that test response mechanisms. Triage consists of rapidly classifying the injured on the basis of the severity of their injuries

and the likelihood of their survival with prompt medical intervention. Different color coding of triage is **Red—high priority treatment, Yellow—medium priority, Green—ambulatory patient and Black—dead or moribund patients.**

F. **Strengthening of all health care facility:** By maximizing bed availability, medical and surgical services, and diagnostic facilities for providing care to casualties. Provisions should be made for food and shelter. A center should be established to respond to inquiries from patient's relatives and friends.

G. **Planning for protection of water source and distribution system:** Testing of water quality for physical, chemical and bacteriological surveillance.

H. **Planning for supplying foods to disaster affected victims:** As malnutrition is very common following flood according to type, duration and extent of disaster. Infants, children, pregnant women, nursing mother and sick persons are more vulnerable. Planning should be done for quick and safe food supply to the disaster affected victims.

Y13.2: Describe disaster management cycle.

Q2 Describe disaster cycle. *(WBUHS, 2022, 2024; AKUB, 2022; VKSUAB, 2016; RUJH, 2023; GOAU, 2023; SSUHSA, 2023; KIMS, 2023; VNSGUS, 2023)*

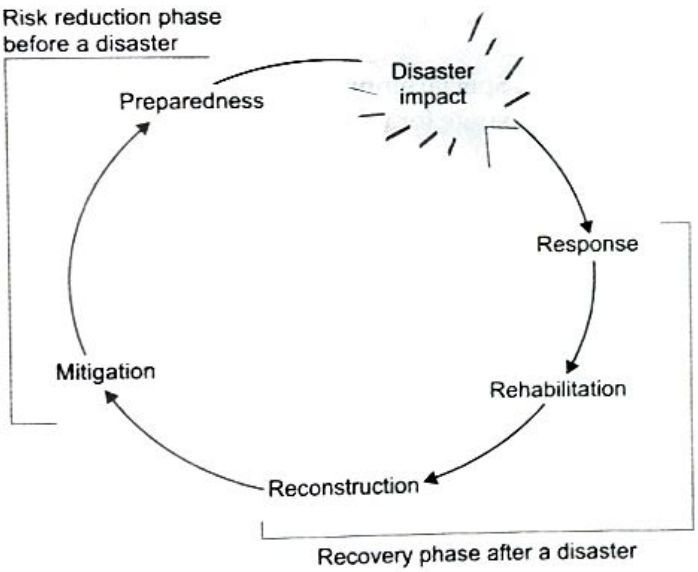

Fig.13.1: Disaster cycle.

Disaster cycle **(Fig. 13.1)** is cyclic management events following a disaster.

Stages:

A. **Disaster impact and response:**

- *Search, rescue and first aid:* The uninjured survivors who come to immediate help. These survivors are organized, they come to rescue and provide first aid.
- *Field care:* Food has to be provided at place of disaster. People are sheltered in tents, schools and community halls.

  Health resource persons and other volunteers, police, home guards are deployed to place. An enquiry center to be established to respond to patients, friends, relatives and family members. Dead victims need to be identified and adequate mortuary space to be provided.
- *Triage:* Triage is a system of color-coding causalities based on severity of injuries and chances of survival with medical supervision. It is carried out at the site and done as follows:

Priority-I (red color)	Priority-II (yellow color)	Priority-III (green color)	Priority-IV (black color)
Critically ill patients requiring immediate resuscitation within 6 hours	Moderately ill patients requiring medical attention within 24 hours	Ambulatory patients with minimum risk	Moribund patients or dead

- *Tagging:* Identification of patients with tags providing information such as name, age, contact details, triage color and treatment given.
- *Identification of dead:* Dead bodies need to be removed from the site of disaster, shifted to mortuary, identified and reception of bereaved family members/relatives. Proper respect for the dead is of great importance.

B. **Disaster containment (stage of health and medical relief):**
- *Most crucial phase:*

Primary phase (0-6 hours)	Secondary follow up (6–24 hours)	Tertiary clean-up (1–60 days)
First aid, medical care	Transportation, sanitation, preventing the spread of communicable diseases and vaccination	Food, blankets, clothing, shelter assistance, social service, employment and rehabilitation

- Rehabilitation *(RUJH, 2021; MU, 2023)*

Water supply: Important and best way to provide water supply is by chlorination with residual chlorine concentration of 0.7 ppm. Survey the area to find source of water and protect it from contamination by animals and excreta.

Sanitation and personal hygiene: Special emphasis is given for disposal of human excreta by construction of temporary trench latrines, separate for men and women. Provide facilities for bathing, washing and cleaning.

Food safety: Take measures to prevent foodborne outbreaks like washing hands before eating food and after using toilets.

Vector control: Insecticide spaying and other measures taken immediately to control vectors.

C. **Disaster mitigation:** Measures designed to either prevent hazards from causing emergency or to lessen the effects of emergency.

D. **Disaster preparedness:** Consists of strengthening capacity of a country to manage efficiently all type of emergencies, so that resources should be able to provide assistance to the victims and bring back to normal life.

CM13.3: Describe man-made disasters in the world and in India.

Q2a. Describe man-made disasters in the world and in India. *(SSUHSA, 2023, 2024)*

Ans: **Man-made disasters:** There are many disasters which have large elements of human causation either accidental or intentional. These can be divided in to three categories viz.

A. **Sudden disasters:** Bhopal Gas Tragedy in India on 3rd December 1984, leakage of storage tank of Union Carbide Pesticide Plant released tons of Methyl Isocyanate into air.

B. **Insidious disasters:**
- Insidious chemical and radiation exposure from nuclear weapons production factories, research laboratories resulting in release of radioactive substances into air, soil and underground water
- Chemical plants releasing toxic by-products into rivers and other water sources.
- Global warming (green-house effect) caused by depletion of ozone layer due to the use of aerosolized chlorofluorohydrocarbons.

C. **Disaster due to war and conflicts:** Attack on twin tower, world trade center in New York in 6000 people lost their lives and many were injured.

Disasters in the world: Since World War-II, there have been about 127 wars and 21.8 million war related deaths involving more than 50% of the civilians. Air-borne powder and wide range of modern weapons used

in war, causing entire population at risk, disrupting food production and supply chains, fragile ecosystem and increased number of refugees. More than half of civilian deaths due to war-related famines.

Disaster in India: India is highly disaster-prone country in Asia-Pacific region with an average of 8 major natural calamities in a year. While floods, cyclones, draughts, earthquakes, frequent epidemic time to time, accidents in railways, mines and factories.

Disaster-prone areas in India:

Areas	*Type of disaster*
Northern mountain regions	Snowstorms, landslides, earthquakes
Eastern coastal region	Severe floods, cyclone
Western desert region	Draughts
Odisha/West Bengal (2020)	Super-cyclone (Amphan)
Gujarat (2001)	Earthquake
Indian ocean (2004)	Tsunami
Uttarakhand (2013)	Cloudburst causing floods
Bhopal/MP (1984)	Methyl Isocyanate gas leak
COVID-19 (2020-21)	Pandemic

Q13.4: Describe the details of the National Disaster Management Authority.

Q2b. Describe the details of the National Disaster Management Authority.

Ans: National Disaster Management Authority:

Structure:

National disaster management authority (NDMA) is headed by the Prime Minister
↓
State disaster management authority (SDMA) headed by respective Chief Ministers
↓
District disaster management authority (DDMA) headed by the district collector and co-chaired by Chairperson of local bodies

Those bodies have been set up to facilitate a paradigm shift from hitherto relief-centric approach to more proactive, holistic and integrated approach of strengthening disaster preparedness, mitigation and emergency response.

National Disaster Management Authority and Disaster Preparedness: Following tsunami in 2004, it has been decoded that the Government will constitute a national disaster management authority and also install an early warning system to tackle calamities like Tsunami. Disaster Management Act' 2005 has been passed and National Disaster Management Authority (NDMA) has been constituted headed by the Prime Minister as ex-officio-chairperson. NDMA has released series of guidelines on formulating policies, plans, capacity building, prevention, mitigation and preparedness for various disasters. The guidelines have been released in the areas of earthquakes, chemical (industrial) disasters, floods, preparation of state disaster plans, medical preparedness and mass casualty management (based on triage approach which consisting of color coding of victims to determine priority).

The 15th guideline on **Incident Response System (IRS)** in disaster was released on 21st July 2010. IRS teams are predesigned at state, district, subdivision and tehsil and block level.

Key features of IRS are: Management of objectives, unity and chain of command, transfer command, organization, flexibility, span of control, area command, unified command, common terminology, accountability, integrated communications, resources management and incident action plan.

National institute of disaster management has been set up along with state and district management authorities have been constituted for rapid response. National Disaster Response Force (NDRF) are kept ready for immediate deployment. India having national, state and district level plans and committee on disaster management. All big hospitals have their own disaster management plans, periodically these committees meet and review the preparedness.

Emergency Medical Relief (EMR) Division of Directorate General of Health Services, MOH and FW, GOI coordinates health relief activities.

Central Medical Stores at Karnal, Mumbai, Chennai, Hyderabad, Kolkata and Guwahati are kept in ready to provide essential drugs and other medical supplies.

National Institute of Communicable Diseases (NICD) at Delhi, All India Institute of Hygiene and Public Health, Kolkata and National Environmental Engineering Research Institute (NEERI), Nagpur are national collaborative centers for disaster preparedness to provide technical support to states, districts in any disaster events.

Indian Meteorological Department (IMD) plays key roles in forewarning about disaster like cyclone. Example "Fani."

National level: National Contingency Action Plan (NCAP) facilitates relief and rescue operation without delay.

State level: The state governments are autonomous in organizing relief operations and long-term preparedness/rehabilitation measures.

District level: Headed by DM, engaged in directing, supervising and monitoring relief measures for disaster and also preparation of district level plans.

SHORT NOTES AND RELEVANT QUESTIONS

Q3. Triage. *(WBUHS, 2017, 2018; ABKUB, 2010, 2011, 2021; SAMU, 2016, 2022; TRIU, 2013, 2023; KIMS, 2021, 2022, 2024; MGUB, 2023, 2024; TDMGRMU, 2013, 2014; RGUHS, 2013, 2015; SSUHSA, 2017, 2021, 2023, 2024; NU, 2015, 2017; VNSGUS, 2023; GOAU, 2021; AKUB, 2024; GNSUB, 2023; SDVPG, 2023)* **Or Triage approach can provide maximum benefit in disaster situation—Justify.** *(WBUHS, 2016, 2021, 2023)*/**How Triage helps in disaster management?** *(AKUB, 2023)*

Ans: Concept of triage:

- Triage consists of rapidly classifying the injuries on the basis of the severity with prompt medical interventions.
- It does not follow the regular "first come first serve" basis.
- Highest priority is given to victims whose immediate or long-term prognosis can be dramatically affected by simple intensive care.
- Low priority is given to those who are severely affected but even with treatment their survival is questionable.

International color code system of triage:

Priority	Colors	Condition of the victims
Priority I (Highest priority)	Red	Critically-ill patients who need immediate medical/surgical intervention within 6 hours
Priority II (High)	Yellow	Moderately-ill patients who need resuscitation within 24 hours
Priority III (Low)	Green	Ambulatory patients with minimum risk
Priority IV (Least)	Black	Dead or moribund patients

Q4. Explain vaccination in disaster. *(WBUHS, 2018)*

Ans: Health authorities are often started mass vaccination of typhoid, cholera and tetanus for public and political pressure.

- WHO does not recommend typhoid and cholera vaccines in routine use in endemic areas.
- Vaccination program requires large number of health workers who could be better employed elsewhere after disaster.
- Supervision of sterilization and injection techniques may be impossible, resulting in more harm than good. However, these vaccinations are recommended for health workers.
- Mass vaccination of population against tetanus is usually unnecessary. The best protection is maintenance of a high level of immunity in the general population by routine vaccination before the disaster occurs, adequate wound cleaning and treatment. If tetanus toxoid (TT/Td) was not received more than 10 years ago and having an open wound, a booster TT/Td is effective preventive measure. If routine immunization programs are being conducted in camps with large number of children, Td (tetanus diphtheria) could be included.
- Natural disasters may negatively affect the maintenance of on-going national or regional eradication programs against poliomyelitis as well as routine immunization. Disruption of these programs should be monitored closely.
- The vaccination policy to be adopted should be decided at senior level only.

MULTIPLE CHOICE QUESTIONS (MCQS)

1. **Arrange the following in logical sequence:** *(AFUH, 2022)*
   a. Disaster impact-mitigation-rehabilitation-response
   b. Disaster impact-response-rehabilitation-mitigation
   c. Rehabilitation-response-disaster-impact-mitigation
   d. Response-disaster impact-mitigation-rehabilitation

2. **In disaster impact and response, what comes after impact?** *(ABKUB, 2021)*
   a. Mitigation b. Rehabilitation c. Preparedness d. Response

3. **Black color in triage is:** *(ABKUB, 2018; GNSUB, 2023)*
   a. Death b. Transfer c. High priority d. Low priority

4. **In triage during disaster, black color indicates:** *(GITAMAP, 2023)*
   a. Dead b. High priority treatment
   c. Ambulatory patient d. Medium priority

5. **Triage is known as:** *(RUJH, 2023; VBUJH, 2023)*
   a. First come first treat policy in a health center
   b. Prioritize treatment and transfer to health center
   c. Search for critically-ill and dead bodies
   d. Keep all the affected persons irrespective of their condition, at a common, safe shelter home

6. **Bhopal gas tragedy in India occurred in:** *(WBUHS, 2023)*
   a. 1983 b. 1984 c. 1985 d. 1986

7. **Which gas leakage was the main cause of Bhopal Gas tragedy?** *(MU, 2024)*
   a. Methyl isocyanide b. Sodium carbide c. Uranium isotope d. Carbon monoxide

8. **Following is not a fundamental aspect of disaster management:** *(AKUB, 2024)*
   a. Disaster response b. Disaster preparedness
   c. Disaster remembrance d. Disaster mitigation

9. **Which of the following comes under recovery phase after a disaster?** *(DBRAUA, 2024)*
   a. Response b. Rehabilitation c. Reconstruction d. All of the above

Answers:

1.	b	**2.**	d	**3.**	a	**4.**	a	**5.**	b	**6.**	b	**7.**	a	**8.**	c	**9.**	d

FILL IN THE BLANKS (DISASTER MANAGEMENT)

1. Nodal center in case of disaster management is _____. (SAMU, 2015)

Answer:

1. National Institute of Disaster Management

APTER

14

Hospital Waste Management

14.1: Define and classify hospital waste.

Q1. Define and classify hospital waste: *(MU, 2023; KIMS, 2023; DBRAUA, 2024)*

ans: **Definition of waste:** Everything is made for a defined purpose. **"Anything which is not intended for further use is termed waste".** With industrialization and increasing urbanization, the quantum of urban solid waste is increasing, and health care is also one of the industries.

Waste generated during the diagnosis, treatment, and immunization of human beings or animals is called **'biomedical waste (BMW)'**.

Types of biomedical waste:

The different **types of biomedical waste** generated in the hospital are described below.

General health care waste (HCW): About 85-90% of HCWs belong to general or nonrisk category.

Examples: Paper, plastics, rags earthen vessels, leftover food materials and kitchen/canteen waste containing vegetable wastes, etc.

Hazardous HCW: About 10-15% of HCWs belong to hazardous/health care risk category.

Examples: Soiled waste, microbiology and biotechnology waste, waste sharps, pathological waste, etc.

Classification of hazardous waste: WHO has classified hazardous waste into following categories:

Type of waste	*Details*
Infectious waste	Laboratory culture, waste from isolation wards, tissue-swabs, materials in contact with infected patient and excreta
Pathological waste	Body parts blood and other body fluids, fetus
Sharps	Needles, infusion sets, scalpels, knives, blades and broken glass
Pharmaceutical waste	Expired drugs, contaminated bottles, boxes
Genotoxic	Waste containing cytotoxic drugs, genotoxic chemicals
Chemical waste	Laboratory reagents, expired disinfectants, solvents
Waste with heavy metals	Batteries and broken thermometers
Pressurized containers	Gas cylinders, gas cartridges and aerosol cans
Radioactive materials	Unused liquid from radiotherapy, contaminated glassware, urine, excreta from patient treated with unsealed radio nucleotides

CM14.2: Describe various methods of treatment of hospital waste.

Q1a. Name the different types of biomedical waste generated in your hospital. Suggest measures for their safe disposal as per national and state rules. What is the importance of waste tracking? *(WBUHS, 2012, 2019, 2023; MGUB, 2022; ABKUB, 2019; PBDSUHSH, 2017, 2015; TRIU, 2014, 2021, 2024; SAMU, 2012, 2013; YSRUHSAP, 2023; TDMGRMU, 2016; SSUHSA, 2017, 2024; DU, 2014; SMU, 2010; NIMSUR, 2015; NU, 2014, 2016; RUJH, 2010; SDVPG, 2023; GOAU, 2022)* **There are 4 types of color coding bags as per Biomedical Waste Management Rule 2016, amended at 2018—Explain.**

(WBUHS, 2021; AKUB, 2023; MU, 2023; KIMS, 2023)

Ans: Color coded biomedical wastes, categories and their segregation, collection, treatment:

Category	*Type of waste*	*Type of bag of container to be used*	*Treatment and disposal options*
Yellow	**A. Human anatomical waste:** Human tissues, organs, body parts and fetus below the viability period.	Yellow colored non-chlorinated plastic bags.	Incineration or plasma pyrolysis or deep burial*
	B. Animal anatomical waste: Experimental animal carcasses, body part, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	C. Soiled waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration or plasma pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	D. Expired or discarded medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials, etc.	Yellow colored non-chlorinated plastic bags or containers.	Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1,200°C or to a common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1,200° encapsulation or plasma pyrolysis at 1,200°. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	E. Chemical waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow colored non-chlorinated plastic bags or containers.	Disposed of by incineration or plasman pyrolysis or encapsulation in hazardous waste treatment, storage and disposal facility.
	F. Chemical liquid waste: Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, silver X-ray film developing liquid, discarded formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities, etc.	Separate collection system leading to effluent treatment	After resource recovery the chemical liquid waste shall be pre-treated before mixing with other wastewater.
	G. Discarded linen, mattresses beddings contaminated with blood or body fluid.	Nonchlorinated yellow plastic bags or suitable packing material.	Nonchlorinated chemical disinfection followed by incineration or plasma pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or plasma pyrolysis.
	H. Microbiology, biotechnology and other clinical laboratory waste: Blood bags, laboratory cultures, stocks or specimens of micro-organisms, lice or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devises used for cultures.	Autoclave safe plastic bags or containers.	Pre-treat to sterilize with nonchlorinated chemical on-site as per National AIDS Control Organization or World Health Organization guidelines thereafter for Incineration.

Contd

Type of waste	Type of bag of container to be used	Treatment and disposal options
Contaminated waste (recyclable): Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bag, syringes (without needles and fixed needle syringes) and vacutainers with their needles cut and gloves.	Red colored non-chlorinated plastic bags or container.	Autoclaving or microwaving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil, or for road making, whichever is possible Plastic waste should not be sent to landfill sites.
Waste sharps including metals: Needles, syringes with fixed needled, needled form needles tip cutter or burner, scalpels blades or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps.	Puncture proof, leak proof, tamer proof containers.	Autoclaving or dry heat sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combinations of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes	Cardboard boxes with blue colored marking.	Disinfection (by soaking the washed glass waste after cleaning with detergent and sodium hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
Metallic body implants	Cardboard boxes with blue colored marking.	

...sal of deep burial is permitted only in rural or remote areas where there is no access to common biomedical waste treatment facility. The burial ...shall be located as per the provisions and guidelines issued by Central Pollution Control Board from time to time.

Guidelines for handling and disposal of waste generate during treatment, diagnosis and quarantine of COVID-19 patients: In order to deal with COVID-19 pandemic, State and Central Governments have initiated various steps, which include setting up of quarantine centers/camps, Isolation wards, sample collection centers and laboratories.

These guidelines are based on current knowledge on COVID-19 and existing practices in management of infectious waste generated in hospitals while treating viral and other contagious diseases like HIV, H1N1, etc. These guidelines will be updated if need arises under Revision-4.

1. **COVID-19 Isolation wards (isolation wards are those where COVID-19 positive patients are being kept for treatment/diagnosis):**
   - Keep separate color-coded bins (with foot operated lids)/bags/containers in wards and maintain proper segregation of waste as per BMWM Rules, 2016 as amended and CPCB guidelines for implementation of BMW Management Rules.
   - As a precaution double layered bags (using 2 bags) should be used for collection of waste from COVID-19 isolation wards so as to ensure adequate strength and no-leaks.
   - Collect and store biomedical waste separately prior to handing over the same common biomedical waste Treatment Facility (CBWTF). Use a dedicated collection bin labeled as "COVID-19" to store COVID-19 waste and keep separately in temporary storage room prior to handing it over to authorized staff of CBWTF. Biomedical waste collected in such isolation wards can also be lifted directly from ward into CBWTF collection van.
   - In addition to mandatory labeling, bags/containers used for collecting biomedical waste from COVID-19 wards, should be labeled as "COVID-19 waste". This marking would enable CBWTFs to identify the waste easily for priority treatment and disposal immediately upon the receipt.

- General solid waste comprising of wrappers of medicines/syringes, fruit peel offs, empty juice bottles or tetra packs, used water bottles, discarded papers, carton boxes of medicines, empty bottles of disinfectants, left-over food, disposable food plates, etc., should be collected separately as per SWM Rules, 2016. In order to minimize waste generation, as far as possible, nondisposable items must be used for serving food, which are to be handled with appropriate precautions and cleaned and disinfected as per hospital guidelines. If use of disposable items is inevitable, use biodegradable cutlery. The wet and dry solid waste bags to be tied securely in leak-proof bags, sprayed with sodium hypochlorite solution and handover to authorized waste collector of ULB's on daily basis. Yellow colored bags should not be used for collecting general solid waste. Compostable bags should be used for collecting wet-waste.
- Maintain separate records of waste generated from COVID-19 isolation wards.
- Use dedicated trolleys and collection bins in COVID-19 isolation wards. A label "COVID-19 waste" to be pasted on these items also.
- The (inner and outer) surface of containers/bins/trolleys used for storage of COVID-19 waste should be disinfected with 1% sodium hypochlorite solution daily.
- Report opening or operation of COVID-19 ward and COVID-19 ICU ward to SPCBs/PCCs and respective CBWTF located in the area.
- Register in CPCB mobile application namely 'COVID-19 BWM' to update the details of COVID-19 biomedical waste generation.
- Depute dedicated sanitation workers separately for biomedical waste and general solid waste so that waste can be collected and transferred timely to temporary waste storage area.
- Feces from COVID-19 confirmed patient, who is unable to use toilets and excreta is collected in diaper, must be treated as biomedical waste and should be placed in yellow bag/container. However, if a bedpan is used, then feces to be washed into toilet and cleaned with a neutral detergent and water, disinfected with a 0.5% chlorine solution, then rinsed with clean water.
- Collect used PPEs such as goggles, face-shield, splash proof apron, plastic coverall, hazmat suit, nitrile gloves into red bag.
- Collect used mask (including Triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen Gown, nonplastic or semi-plastic coverall in yellow bags.
- Used masks, tissues and toiletries, of COVID-19 patient shall become biomedical waste and shall be segregated in yellow bag.
- Segregation of biomedical waste and general solid waste should be done at the point of generation in wards/isolation rooms. There should be no segregation of biomedical waste and solid waste at temporary waste collection/storage area of healthcare facility to ensure occupational safety.

2. **Sample collection centers and laboratories for COVID-19 suspected patients:** Report opening or operation of COVID-19 sample collection centers and laboratories to concerned SPCB/PCC. Guidelines given at section (a) for isolation wards should be applied suitably in case of test centers and laboratories. Pre-treat viral transport media, plastic vials, vacutainers, Eppendorf tubes, plastic cryovials, pipette tips as per BMWM Rules, 2016 and collect in red bags.
3. **Responsibilities of persons operating quarantine centers/camps/home quarantine or home care facilities:**
   - General solid waste (household waste) generated from quarantine centers or camps should be collected in bags, securely tied and handed-over to municipal solid waste collector identified by Urban Local Bodies for final disposal.
   - General solid waste should comprise of waste generated from kitchen, packaging material, waste food material, waste papers, waste plastics, floor cleaning dust, etc., including left-over food, disposable utensils, water bottles, tetra packs, used by suspected quarantined persons and COVID-19 patient at homecare or home quarantine.
   - Only the used masks, gloves and tissues or swabs contaminated with blood/body fluids of COVID-19 patients, including used syringes, medicines, etc., if any generated should be treated as biomedical waste.

- Biomedical waste if any generated from quarantine centers/camps should be collected separately in yellow bags (suitable for biomedical waste collection) provided by ULBs. These bags can be placed in separate and dedicated dustbins of appropriate size. General waste should not be stored in yellow bags.
- Agency responsible for operation of quarantine center/camp shall designate a nodal person who will be responsible for waste management and for maintenance of its record.
- Designated nodal person of the quarantine center/camp shall register the center/camp on CPCB's biomedical waste tracking App 'COVID-19BWM' (available on Google play store) and update the details of waste generated on daily basis.
- Persons operating quarantine camps/centers should call the CBWTF operator to collect biomedical waste as and when it gets generated. Contact details of CBWTFs would be available with local authorities.

4. **Disposal of used PPEs:** Waste masks and gloves in general households should be kept in paper bag for a minimum of 72 hours prior to disposal of the same as dry general solid waste after cutting the same to prevent reuse.

Q10. Safe disposal of waste:

Remedial measures of their safe disposal are adopted as per National and State rules. Government of India has prescribed certain procedures and guidelines for disposal of hospital waste.

- Waste collection
- Segregation
- Transportation and storage
- Treatment and disposal
- Transport to final disposal site
- Final disposal

Collection of waste: The waste should be collected and stored in thick, noncorrosive, disposable plastic bags of adequate size, which may be kept in a hard plastic container of suitable size covered with a lid. Polythene bags and containers of specified coded colors that are levelled approximately with nonwashable materials are used for specific type of hospital waste to enable proper treatment and disposal of these wastes.

Segregation at source: The hospital wastes of different categories are segregated at source by personnel and collected in color coded containers. They should be allowed to fill to a maximum of three quarters of their capacity to prevent the bag from tearing and also to facilitate the ease of transport by workers.

Transportation: Internal and external transportation is an integral part of hospital waste management system. Within the hospital, the plastic bags tied well and transported by handcart to a storage point. Organic matters may produce odor and becomes risk of infection. Specially designed vehicle should be used to transport of waste in covered containers.

Storage: Daily hospital waste from different sections of hospital waits for final disposal and a separate store room/closed vat is used for this purpose. It should be away from service area and should be cleaned and dry to prevent rodent nuisance.

Treatment: Treatment modifies the wastes before final disposal. The objectives of waste treatment are as follows:

- Decontamination of waste
- Reduction of bulk volume of incinerator
- To give the waste an aesthetic part
- To destroy reusable infected materials like needles and syringes.

Available treatment and disposal technologies: *(NU, 2013, 2015, 2016; VBUJH, 2023)*

A. **Incineration**

This method consists of burning the waste in incinerator to a very high temperature of about 1000°C, resulted organic and combustible solid waste to inorganic, incombustible matter, results in a very significant reduction of waste volume and weight. Thus, converting the waste into bottom ash and fly ash that cannot be recycled, reused or disposed off in a landfill site.

Characteristics of the waste suitable for incineration are:

- *Low heating volume:*
  - Above 2,000 kcal/kg for single chamber
  - Above 3,500 kcal/kg for double chamber
- Combustible matter above 60%
- Noncombustible solids below 5%
- Noncombustible fines below 20%
- Moisture content below 30%

Waste not suitable for incineration:

- Pressure gas container
- Large amount of reactive chemical waste
- Silver salts and photographic or radiographic wastes
- Halogenated plastic like PVC
- High mercury or cadmium containing waste like broken thermometers, used batteries and lead-lined wooden panels and
- Sealed ampules or ampules containing heavy metals
- Sharp wastes
- Cytotoxic drugs

B. **Chemical disinfection:** Destruction of pathogens from surface of waste by using chemical disinfectants like bleaching powder, alcohols, and quaternary ammonium compounds is often done. The instrument, equipment, infected sharps, contaminated floor, beds may be disinfected by using chemicals.

C. **Wet thermal treatment (autoclaving)**

D. **Dry thermal treatment (screw feed technology)**

E. **Deep burial**

Standards for deep burial

- A pit or trench should be dug about 2 meters deep with 1.5 meter square
- The site should be impermeable, away from habitation and not prone for flooding or erosion and authorized by the appropriate authority.
- They should not contaminate the surface water. No shallow well close to the site.
- The pit is half filled with waste, then covered with lime within 50 cm of the surface, before filling rest of the pit with soil.
- For each occasion, waste is added to the pit, a layer of 10 cm of soil should be added to cover the wastes.
- Burial should be performed under close and strict supervision
- Animals should not access to it. Covering the area with galvanized iron/ware meshes is required to create nuisance.

F. **Landfilling:** The Municipality or Medical authority should be disposed and treat the waste materials. It means disposal of residual solid wastes on land with protective measures against pollution of ground water, surface water and air. The sanitary landfills are constructed for disposal of nonbiodegradable infectious hospital wastes. This method is simple and cost-effective.

There are two types of disposal—**land open dumps and sanitary landfills**. Health care waste should not be deposited on or around open dumps. This is creating risk because of people or animals coming into contact with infectious pathogens.

Sanitary landfills are designed to have at least some advantages over open dumps:

- Geological isolation of waste from the environment
- Appropriate engineering preparation before the site is ready to accept waste
- Staff present on site to control operations
- Organized deposit and covered daily with earth and hay
- Area is sprayed with insecticides frequently

G. **Recycling:** All reusable materials are separated from refuse and used.

- Paper and rags are used for paper production.
- Plastics are sorted out by type and recycled separately for the manufacture of plastic buckets, pots, mugs, etc.
- Glass, rubber, aluminium, copper, iron, brass, etc., are melted and used for respective purposes
- Discarded tube lights are used for the manufacture of laboratory glassware.
- Garbage and plant wastes are used for composting
- Animal excreta are separated and used for biogas production.

(SSUHSA, 2006; MUHS, 2019)

Composting

In this method the refuse is disposed off along with the nightsoil or sewage. There are two methods—biological and mechanical.

1. *Biological:* This method is also called Bangalore method or anaerobic method or hot fermentation process. In this method, trenches are dug measuring 5–10 meters length, 2 meters breadth and 1 meter depth, away from the city limits. Alternate layers of refuse and human excreta (nightsoil) are put into the trench, in the thickness of 15 cm and 5 cm respectively, the first and last layer being that of refuse. The trench is then covered with excavated earth.
   Within about a week intense heat is generated to about to about 60°C, persisting for about 2–3 weeks killing all pathogens and the parasites. The lignins and cellulose are broken down. The end products of decomposition are acted upon by fungi and anaerobic bacteriae, resulting in harmless, odorless, innocuous human mass, called **'Compost'**, which has high manorial value. It is sold as organic manure, without causing any nuisance. It is ready for application to the land.
2. *Mechanical:* This is also called **'Aerobic method'**.
   In this method, the refuse is first cleared of salvageable materials such as rags, bones, pieces of metals, woods, glasses, etc. and then powdered in a pulverizer. It is then mixed with human nightsoil in a rotating machine and incubated for 4–6 weeks, at the end of which the entire process of composting is complete by the action of temperature, moisture, pH and aerobic bacteriae. The mixture gets changed to compost. This method is in vogue in developed countries.

Newer technologies:

- Microwave irradiation
- Plasma torch technology
- Gamma irradiation
- Hydroclave
- Pyrolator
- Bacterial cultures

Importance of waste tracking: Tracking of Medical Waste outlined how the program should manage the transportation of waste materials.

Four requirements were primarily identified:

1. To provide a means of monitoring the transportation of waste from the generator to the disposal facility unless said waste had previously been incinerated.
2. Generator of the waste will be ensured that the waste had been received by the disposal facility
3. A uniform form will be developed for the tracking of materials across country
4. A means will be developed to label and contain the wastes for the safety of the handlers.

It was **designed primarily** to monitor the treatment of medical wastes through their creation, transportation and destruction, i.e., from cradle-to-grave.

Q16. What are the different methods of solid waste disposal with special reference to rural area?

(BNMUB, 2003)

Ans: The different **methods of solid waste disposal** with special reference to **rural area** have been prescribed by the authority of India and it is implemented through different states.

The following methods are commonly used in rural areas:

- **Deep burial**
- **Worm composting**
- **Chemical disinfection**
- **Landfilling**

You are referred to question no. 1 for details.

Q2. A recent public demonstration has occurred in a block primary health center about disposal of biomedical waste containing water body by the side of the hospital. As a BMOH of the hospital, what measure would you like to adopt for proper waste management of your hospital? *(WBUHS, 2016, 2017)* **Or biomedical waste should be segregated at source (Hospital/Nursing Homes).** *(WBUHS, 2017, 2022, 2024; MGUB, 2023, 2024; KIMS, 2023)*/**Segregation of waste is the most challenging part of hospital waste management—explain.** *(AKUB, 2024)*

Ans: As a recent public demonstration has occurred in a block primary health center (BPHC) about disposal of Biomedical Waste (BMW) containing water body by the side of the hospital, being authority of a hospital at this level, BMOH should be proactive and manage the situation.

General concept on BMW:

Biomedical waste: Biomedical waste is any kind of waste containing infectious (or potentially infectious) materials. It may also include waste associated with the generation of biomedical waste that visually appears to be of medical or laboratory origin (e.g., packaging, unused bandages, infusion kits, etc.), as well research laboratory waste containing biomolecules or organisms that are mainly restricted from environmental release. Discarded sharps are considered biomedical waste whether they are contaminated or not, due to the possibility of being contaminated with blood and their propensity to cause injury when not properly contained and disposed of. Biomedical waste is a type of biowaste. Biomedical waste is generated in BPHC from medical sources and activities, such as the diagnosis, prevention, or treatment of diseases. In healthcare facilities (i.e., hospitals, clinics, doctor›s offices, veterinary hospitals and clinical laboratories), waste with these characteristics may alternatively be called medical or clinical waste.

Biomedical waste is distinct from normal trash or general waste, and differs from other types of hazardous waste. This facility generates waste hazardous with chemicals and microbial materials. While such wastes are normally not infectious, they require proper disposal. Some wastes are considered multi-hazardous, such as tissue samples preserved in formalin. BPHC generates most of the mentioned wastes.

Risk: Disposal of this waste is an environmental concern, as many medical wastes are classified as infectious or bio-hazardous and could potentially lead to the spread of infectious disease. The most common danger for humans is the infection which also affects other living organisms in the region. Daily exposure to the waste (landfill) leads to accumulation of harmful substances or microbes in the person's body.

Water body may be contaminated or polluted from the wastes produced in the health center. The wastes may be solid (general or hazardous) or liquid (sullage or hazardous). This can cause harm the lives of water body and users of water body.

Management: Biomedical waste must be properly managed and disposed of to protect the environment, public and workers, especially healthcare and sanitation workers who are at risk of exposure to biomedical waste as an occupational hazard. Steps in the management of biomedical waste include generation, accumulation, handling, storage, treatment, transport and disposal.

On-site versus off-site: Disposal occurs off-site, at a location that is different from the site of generation. Treatment may occur on-site or off-site. On-site treatment of large quantities of biomedical waste usually requires the use of relatively expensive equipment and is generally only cost effective for very large hospitals and major universities who have the space, labor and budget to operate such equipment. Off-site treatment and disposal involve hiring of a biomedical waste disposal service whose employees are trained to collect and haul away biomedical waste in special containers (usually cardboard boxes, or reusable plastic bins) for treatment at a facility designed to handle biomedical waste.

Generation and accumulation: Biomedical waste should be collected in containers that are leak-proof and sufficiently strong to prevent breakage during handling. Containers of biomedical waste are marked with a **biohazard symbol. The container, marking, and labels are often red.**

Discarded sharps are usually collected in specialized boxes, often called needle boxes.

Generated wastes should be properly carried to a site to concrete made large bin covered and protected from animals to reduce its spread in an unsightly manner as a temporary storage. This will be finally transmitted by a hired body for this activity. Liquid waste may contaminate large water body which may function as a source of hazards causing health harm. Liquid waste may be converted nonhazardous through local treatment. This is operated in large hospital. In BPHC, it can be started with the help of other coordinating department (general administration, public health engineering, etc).

Storage: Storage refers to keeping the waste until it is treated on-site or transported off-site for treatment or disposal. There are many options and containers for storage. Regulatory agencies may limit the time for which waste can remain in storage. Handling is the act of moving biomedical waste between the point of generation, accumulation areas, storage locations and on-site treatment facilities. Workers who handle biomedical waste must observe standard precautions.

Treatment: The goals of biomedical waste treatment are to reduce or eliminate the waste's hazards, and usually to make the waste unrecognizable. Treatment should render the waste safe for subsequent handling and disposal. There are several treatment methods that can accomplish these goals.

- Incineration (burning), autoclaving to sterilize the waste or reduce its microbiological load to a level at which it may be safely disposed of under good administrative controls. For autoclaves and microwave systems, a shredder may be used as a final treatment step to render the waste unrecognizable.
- Microwave disinfection is a newer technique for BMW disinfection.
- For liquids and small quantities, a 1–10% solution of bleach can be used to disinfect biomedical waste. Solutions of sodium hydroxide and other chemical disinfectants may also be used, depending on the waste characteristics. Other treatment methods include heat, alkaline digesters and the use of microwaves.
- BPHC cannot allow liquid waste to enter the water body without ant treatment. Bleaching or sodium hypochlorite solution may be used at smaller level, i.e., at production site.
- Considering all these discussions, BMOH can take initiative for proper waste disposal system, be it solid or be it liquid.
- Segregation of waste at source, its daily disposal at local temporary storage site (bin) through trolley meant for waste, final disposal by hired agency are the basic steps which can be adopted by BMOH.
- Liquid waste treatment at production site and liquid waste treatment at the central collection point are the measures to make a waste from hazardous to nonhazardous waste. Then that nonhazardous waste may be allowed to drain in that water body or other drainage system.
- General public should be taken into confidence that this treated waste is not hazardous anymore.

OM14.3: Describe laws related to hospital waste management.

Q3. Describe laws related to hospital waste management.

Ans: Various schedules in biomedical waste management rules 1998 and 2016: *(SDVPG, 2023)*

Schedule	1998	2016
I	Categories of waste	Color code and type of waste with treatment and disposal
II	Color/code, type of waste, waste category, treatment option	Standard for treatment of disposal of BMW (autoclaving/ microwaving/deep burial/dry heat sterilization/chemical disinfection)
III		List of prescribed authorities and their duties
IV	Level of BMW category/bags	Part A: Level for container/bag
	Level of transport of BMW	Part B: Level for transport of BMW bag/container
V		Added to schedule II
VI	Standard for treatment and disposal of BMW	Added to schedule III
	List of prescribed authorities and their duties	

Guidelines of waste management generate due to COVID-19 pandemic: To deal with COVID-19 pandemic State and Central Governments have initiated various steps, which include setting up of quarantine centers/camps, isolation wards, sample collection centers and laboratories. Following specific guidelines for management of waste generated during diagnostics and treatment of COVID-19 suspected, confirmed patients, are required to be followed by all the stakeholders including isolation wards, quarantine centers, sample collection centers, laboratories, ULBs and common biomedical waste treatment and disposal facilities, in addition to existing practices under BMW Management Rules, 2016. These guidelines are based on current knowledge on COVID-19 and existing practices in management of infectious waste generated in hospitals while treating viral and other contagious diseases like HIV, H1N1, etc. These guidelines will be updated if need arises. This revision-4 of guidelines issued to provide revised guidance on segregation of general solid waste and biomedical waste from quarantine centers/homecare/healthcare facilities treating COVID-19 patients and to recommend on disposal of PPEs. Guidelines brought out by WHO, MoH & FW, ICMR, CDC and other concerned agencies from time to time may also be referred for understanding other aspects related to COVID-19.

SHORT NOTES AND RELEVANT QUESTIONS

Q4. Principles of biomedical waste management. *(WBUHS 2015*

Ans: Principles of biomedical waste management are as follows:

a. **Waste reduction and management**
   - Reducing the waste quantity by a significant percentage
   - Recycling all paper and cardboard waste
   - Increasing use of recycled products
   - Enhancing the hospital reputation in the community

b. **Waste assessment:** A waste assessment indicates the type and amount of waste generated in the hospital. By interviewed with hospital workers and review of records, the type and quantity of waste generated in hospital can be assessed. Afterwards, disposal strategy can be planned.

c. **Waste recycling:** It helps cost saving and waste volume reduction. Examples are gowns, gloves, masks, syringes, needles, catheters, etc. It is important to note that these reusable articles are properly sterilized before they are reused. Other examples of recycling materials are different kinds of paper, steel and aluminium cans, plastics, ledgers, newspapers, magazines, plastic utensils, computer papers, corrugated cardboard, glass wares, batteries, journals, X-ray film boxes, etc.

d. **Waste disposal:** Government of India has prescribed certain procedures and guidelines for disposal of hospital waste:
   - Collection of waste
   - Source of segregation
   - Transportation
   - Storage
   - Treatment

(SAMU 2015

Q5. How will you handle contaminated metal instruments?

Ans: Metal instruments are under category 4 waste according to the classification of waste. The contaminated metal instruments are treated in the following ways:
- Chemical treatment
- Autoclaving
- Microwaving and mutilation and
- Shredding

Q6. Describe health hazards of biomedical waste. *(WBUHS, 2018; ABKUB, 2017; YSRUHSAP, 2018; SSUHSA, 2006, 2023; GITAMAP, 2023; RGUHS, 2009, 2024; TDMGRMU, 2013; NIMSUR, 2015; GOAU, 2023; MU, 2023; BNMUB, 2023; MGUB, 2024; KIMS, 2023, 2024)*

Ans: **Health hazards of health care waste:** Health care waste poses a great threat of disease and injury if it is not disposed scientifically.

- It contain sharps and needles
- It contain infectious agents
- It contain toxic and hazardous chemicals or pharmaceuticals
- It is radioactive
- It is genotoxic

Who are at risks?

- Doctors, nurses, auxiliaries and hospital maintenance staff
- Patients and their visitors in hospital
- Workers involve in waste disposal
- Scavengers or rag pickers

Health hazards:

- **Hazards from infectious waste and sharps:** Pathogens like HIV, hepatitis viruses, antibiotic resistance bacteria present in health care waste may give access to humans directly through puncture wounds, abrasions or cuts on the skin, mucous membranes or by inhalation or ingestion.
- **Hazards from chemical and pharmaceutical waste:** Chemical and pharmaceutical product in health care waste though present in small quantities, are toxic, corrosive, inflammable, reactive or explosive and causes intoxication by acute or chronic exposure and injuries including burns.
- **Hazards from genotoxic waste:** It may cause toxicity by inhalation, absorption through skin and severity depends upon the toxicity of the substance, extent and duration of exposure.
- **Hazards from radioactive waste:** It causes headache, dizziness and vomiting, etc. The severity may increase depending upon the type, extend of exposure.
- **Public sensitivity:** Particularly the visual inspection of anatomical waste causing public sensitivity.

Q7. What should be the thickness of plastic bags should they be permitted? Why? *(RGUHS, 2011)*

Ans: Plastic bags are very important items for both retailers and shopper in respect to economy and convenience. It has created an adverse impact on environment as well as human being and animals due its abandon use. Thus to control this evergrowing menace, Ministry of Environment and Forest has passed **Plastic Waste (Management and Handling) Rules of 2011.**

Minimum thickness: Minimum thickness of plastic bags made of virgin plastics or recycled plastics shall not be less than 40 microns.

Reasons:

- Plastic bags <40 microns cannot be recycled therefore they are banned
- Plastic having <40 microns will not degrade naturally if it is burned in the ground
- General tendency of people is reuse thicker plastic bags whereas thinner bags are disposed off.

Significance: Awareness generation in respect of adverse impact of plastic bags on health of human being and animals along with environment is the only way to get rid of this problem.

Q8. Describe disposal of sharp waste in health care settings. *(WBUHS, 2016)*

Ans: You are referred to Long Essay Question no. 1.

Q9. Different methods of solid waste disposal in hospital. *(AFUH, 2022)*

Ans: Same as answer from Q1.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. Color coding of container for disposal of human anatomical waste is: *(ABKUB, 2019)*

a. Yellow b. Red c. Blue d. Black

Match the following: *(ABKUB, 2021)*

1. Blood bag	a. Yellow
2. Needles	b. Red
3. Body implants	c. Blue
4. Vacutainers	d. White (transparent)

Options:

a. 1 2 3 4
   a d c b
b. 1 2 3 4
   b d c a
c. 1 2 3 4
   b c d a
d. 1 2 3 4
   a b c d

2. Human body parts generated in a hospital must be disposed in _____ color coded container: *(ABKUB, 2017)*

a. Yellow b. Red c. Blue d. Black

3. The number of infectious wastes among hospital waste is: *(ABKUB, 2017)*

a. 1.5% b. 4.5% c. 25% d. 12%

4. Glassware are discarded in which category? *(ABKUB 2021)*

a. White b. Blue c. Green d. Yellow

5. The percentage of nonhazardous biomedical waste generated in a hospital is: *(ABKUB, 2019)*

a. 85% b. 50% c. 25% d. 15%

6. All the following are proprieties of plastic wastes, *except*: *(ABKUB, 2019)*

a. Biodegradable
b. Resistant to alkalis
c. Have insulating properties
d. Emit toxic gases when brunt

7. Incineration is not done for: *(ABKUB, 2018; GNSUB, 2023; SSUHSA, 2024)*

a. Cytotoxic drugs
b. Waste sharps
c. Human anatomical waste
d. Cotton contaminated by blood

8. Incineration as a process of disposal of solid waste has all the following features, *except*: *(ABKUB, 2019)*

a. Used where landmass is not available
b. Require training of handlers
c. Require air pollution controls
d. Is a suitable method for Indian communication

9. The biological indicator for testing the efficacy of autoclave is: *(ABKUB, 2019)*

a. *Bacillus atrophaeus*
b. *Bacillus stearothermophilus*
c. *Bacillus cereus*
d. *Bacillus subtilis*

10. **Outdated cytotoxic drugs should be disposed by:** *(ABKUB, 2019;AFUH, 2023)*
a. Disposal in municipal waste
b. Common facility for incineration
c. Burial in landfill
d. Autoclaving

11. **The process of mixing waste with cement and other substances before disposal, in order to minimize the risk of toxic substances contained in the wastes migrating into the surface water or ground water is:** *(YSRUHSAP, 2023)*
a. Disposal
b. Microwave irradiation
c. Inertization
d. Screw-feed technology

12. **The color of the puncture proof container used to collect waste sharps such as needles, syringes with fixed needles, scalpels and blades is:** *(YSRUHSAP, 2023)*
a. Blue
b. White (translucent)
c. Yellow
d. Red

13. **Urine bags are discarded in:** *(ABKUB, 2023; RUJH, 2023)*
a. Red
b. Yellow
c. Blue
d. Black

14. **Vials are to be discarded in which color container?** *(GITAMAP, 2023)*
a. Green
b. Yellow
c. Red
d. Blue

15. **All of the following color codes are used in biomedical waste management, *except*:** *(SSUHSA, 2023)*
a. Black
b. Yellow
c. White
d. Violet

16. **The number of categories of Biomedical wastes according to the Biomedical Waste Management Rules, 2010 is:** (TRIU, 2024)
a. 4
b. 5
c. 6.
d. 10

17. **What container would you choose for placenta?** *(KIMS, 2023)*
a. Red pail
b. Grey tote
c. Yellow pail
d. Regular waste

18. **Waste disposal of placenta after delivery is done by:** *(AFUH, 2023)*
a. Disposing in Blue bags followed by incineration
b. Disposing in yellow bags followed by incineration
c. Disposing in blue bags followed by autoclaving
d. Disposing in yellow bags followed by autoclaving

19. **Which of the following waste is disposed in a yellow bag?** *(VNSGUS, 2023)*
a. Blood bag
b. Gloves
c. Sharps
d. Urine bag

20. **Metallic body implants are disposed in:** *(WBHWS, 2024)*
a. Red bag
b. Yellow bag
c. Blue bag
d. Black bag

21. **A patient is under intensive care for COVID-19. The best method to dispose his soiled linen would be:** *(DBRAUA, 2024)*
a. Put in yellow bag and incinerate
b. Disinfect and bury in secured landfill
c. Chemical treatment and burning
d. Chemical treatment wash and reuse

22. **White translucent puncture proof container is used for the disposal of:** *(KIMS, 2023)*
a. Human and animal body parts
b. Radioactive waste
c. Contaminated liquid waste
d. Contaminated needles and sharps

Answers:

1.	a	**2.**	a	**3.**	a	**4.**	b	**5.**	d	**6.**	a	**7.**	c	**8.**	d	**9.**	b	**10.**	c
11.	c	**12.**	b	**13.**	b	**14.**	d	**15.**	d	**16.**	a	**17.**	a	**18.**	b	**19.**	a	**20.**	c
21.	a	**22.**	d																

FILL IN THE BLANKS (HOSPITAL WASTE MANAGEMENT)

1. Needles, syringes, blades, etc., can be disposed in _____ color coded container in a hospital (Blue/Yellow/Red/white) *(KIMS 2019)*

Answer:

1. White

TRUE/FALSE

1. Disposal of placenta at PHC is done by deep burial. *(SAMU 2015)*
2. Blood soaked cotton swab is disposed in yellow bag. *(MU 2024)*

Answers:

1. True
2. True

PTER

5

Mental Health

15.1: Define and describe the concept of mental health.

Q1. Define and describe the concept of mental health.

Ans: **Concept of mental health:** Mental health is defined by WHO, **"It is a state of well-being in which the individual realizes his/her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his/her community"**.

The theme of World Health Day of 2017 was **'depression-Let's talk'**. For someone living with depression, talking to a person they trust is often the first step towards treatment and recovery.

Global burden of mental disorders: About 450 million people currently suffering from mental disorders which is leading causes of ill-health and disability worldwide. Depressive disorders are already the fourth leading cause of global disease burden (WHO). They are expected to rank second by 2020, behind ischemic heart disease.

Burden of mental disorders in India: National Mental Health Survey (NMHS) was conducted in the country to identify the prevalence, pattern, outcome, treatment gap, disabilities along with the current status of medical services and facilities.

Source: National Mental Health Survey of India 2015-2016, MOH and FW, NIMHANS, Bengaluru.

Prevalence of any mental disorder in adult Indian was 10.6% while lifetime prevalence rate was 13.7%. Absolute numbers it comes to 150 million Indians are in need of active intervention/services.

15.2: Describe warning signals of mental health disorder.

Q1a. Describe warning signs of poor mental health. *(RGUHS, 2009, 2012, 2024; TDMGRMU, 2011, 2013; GOAU, 2021; AKUB, 2024; KIMS, 2024)*

Ans: Warning signs of poor mental health are a set of questions designed by **Dr William C Menninger, president, Menninger Foundation, Topeka, Kansas, USA**. They are as follows:

- Are you always worrying?
- Are you unable to concentrate because of unrecognized reasons?
- Are you continually unhappy without justified cause?
- Do you lose your temper easily and often?
- Are you troubled by regular insomnia?
- Do you have wide fluctuation in your moods from depression to elation, back to depression which incapacitate you?
- Do you continually dislike to be with people?
- Are you upset if the routine of our life is disturbed?
- Do your children consistently get on your nerves?
- Are you browed of and consistently bitter?
- Are you afraid without real cause?
- Are you always right and other person always wrong?
- Do you have numerous aches and pains for which no doctor can find a physical cause?

Significance: Each of these 13 questions characterize major psychiatric conditions and [illegible] answer to any of these questions is definitely "yes".

CM15.3: Describe National Mental Health Program.

Q1b. Describe National Mental Health Program/Mental health services are coming forefront (WBUHS, 2020, [illegible])

Ans: National Mental Health Program (NMHP) was launched in India in 1982 with the following objectives:

- To ensure availability and accessibility of minimum mental health care for all in [illegible] particularly to the most vulnerable and underprivileged section of population.
- To encourage application of mental health knowledge in general health care and in [illegible]
- To promote community participation in the mental health services development and to [illegible] towards self-help in the community.

Approaches:

- Integrating mental health services with the existing primary healthcare set-up to increase the [illegible] availability of mental health services.
- To utilize existing infrastructure of health services and deliver minimum mental health [illegible]
- To link mental health services with existing community development program like ICDS and [illegible]
- To provide appropriate task-oriented training to the existing healthcare staff.

District Mental Health Program (DMHP)

Based on the experience and learning from various community health initiatives like "**Bellary Model in Karnataka State**", DMHP was launch in 1996 initially in 4 districts and subsequently extended to 241 [illegible] in the country, now 692 districts are being covered under DMHP.

Objectives of DMHP:

- Providing sustainable basic mental health services to the community and integration with general health services.
- Early detection and treatment of patients in community.
- Reduce the patient load in the mental hospitals.
- Reduce stigma attached to mental illness through changes in attitude and education.
- Treatment and rehabilitation of mentally-ill patients discharged from the mental hospital within the community.

DMHP team members:

- Program office mental health (POMH), clinical psychologist or trained psychologist
- Social worker trained in psychiatry
- Community nurse trained in psychiatry
- Record keeper
- An assistant for program coordination and implementation

Services provided by DMHP:

- Daily outpatient services for psychiatric patients
- Provision of 10 indoor beds for psychiatric patients
- Referral services
- Link with existing primary health centers
- Follow-up services
- Undertaking community survey, if feasible

New components of DMHP/revised DMHP:

A. **Service delivery for mental health:**

- Early detection and treatment
- School mental health services

- Counseling services in college
- Workplace stress management
- Suicide prevention services
- Role of nongovernmental services (NGOs)

B. **Training on basic mental health:**
- Medical officer for 2 weeks
- ANMs/AWWs for 5 days

C. **Information education communication (IEC)/behavior change communication (BCC) activities through:**
- Local/folk media
- Interpersonal communication focus on early detection
- Treatment availability
- Reduction in stigma associated with mental health disorders

SHORT NOTES AND RELEVANT QUESTIONS

Q2 Discuss alcohol control program.

Ans: WHO launches SAFER alcohol control initiative to prevent and reduce alcohol-related death and disability.

WHO-led initiative and action package aim to support global target of reducing harmful use of alcohol by 10% by 2025.

SAFER is the newest WHO-led roadmap to support governments in taking practical steps to accelerate progress on health, beat noncommunicable diseases (NCDs) through addressing the harmful use of alcohol, and achieve development targets.

Health impact of alcohol use:
Alcohol consumption contributes to more than 3 million deaths globally every year and over 5% of the global burden of disease and injury, according to the recently issued WHO Global Status Report (GSR) on Alcohol and Health 2018. It is also a major risk factor for NCDs, including cancers and cardiovascular diseases, communicable diseases such as TB and HIV/AIDS, violence, and injuries. Globally, alcohol consumption is the seventh leading risk factor for premature death and disability.

Q3 SAFER: What it contains?

Ans: **SAFER** provides five high-impact strategic actions that are prioritized for implementation to promote health and development:

1. **Strengthen restrictions on alcohol availability:** Enacting and enforcing restrictions on commercial or public availability of alcohol through laws, policies, and programs are important ways to reduce harmful use of alcohol. Such strategies provide essential measures to prevent easy access to alcohol by young people and other vulnerable and high-risk groups.
2. **Advance and enforce drink driving counter measures:** Road users who are impaired by alcohol have a significantly higher risk of being involved in a crash. Enacting and enforcing strong drink-driving laws and low blood alcohol concentration limits via sobriety checkpoints and random breath testing will help to turn the tide.
3. **Facilitate access to screening, brief interventions, and treatment:** Health professionals have an important role in helping people to reduce or stop their drinking to reduce health risks, and health services have to provide effective interventions for those in need of help and their families.
4. **Enforce bans or comprehensive restrictions on alcohol advertising, sponsorship, and promotion:** Bans and comprehensive restrictions on alcohol advertising, sponsorship and promotion are impactful and cost-effective measures. Enacting and enforcing bans or comprehensive restrictions on exposure

to them in the digital world will bring public health benefits and help protect children, adolescents and abstainers from the pressure to start consuming alcohol.

5. **Raise prices on alcohol through excise taxes and pricing policies:** Action is needed to reduce the burden of alcohol-related harm in low-, middle- and high-income countries. Alcohol taxation and pricing policies are among the most effective and cost-effective alcohol control measures. An increase in excise taxes on alcoholic beverages is a proven measure to reduce harmful use of alcohol and it provides government revenue to offset the economic costs of harmful use of alcohol.

Q4. What is drug addiction? *(RGUHS, 2008; TDMGRMU, 2009, 2014; KIMS, 2015)*

Ans: Drug addiction is defined as **"A state of periodic or chronic intoxication detrimental to the individual and society produced by the repeated intake of habit-forming drugs".**

Criteria to call a person drug addict:

- **Psychological dependence:** It is an overpower desire to take the drug, obtain it by any means
- **Physical dependence:** When the drug is withdrawn, the addict shows withdrawal symptoms in the form of irritation and violent behavior, nausea, vomiting, diarrhea, watering of eye, nose
- **Development of tolerance:** It is a tendency to increase the dose over prolonged period of use.

Causes of drug addiction:

- **Personal factors:**
  - Physical and mental illness
  - Stress
  - Habits and likings
  - Compulsive psychoeducational status
  - Threshold to different odds of life like failures or achievements
- **Social and environmental factors:**
  - Family status
  - Family liability
  - Attachment with family
  - Residential and working environment
  - Sense of responsibility towards family and society

Q5. Explain de-addiction. *(RGUHS, 2012)*

Ans: De-addiction is the process of treatment of patient with drug addiction, It is done as follows:

- Shift the person to an institution to remove him from the association with which the addiction started.
- Constant supervision
  - To assure nonuse of drugs
  - To pay attention towards possible dangerous withdrawal symptoms
  - Stop supply of drug of addiction
- Proper nursing care to improve general health
- Symptomatic treatment for ill health resulting from chronic use of drugs
- Detoxification—reduction in doses of drug over a period of 1-3 weeks
- Treatment of withdrawal symptoms, arising from addiction
- Use of antidotes
- Administration of sedatives, benzedrine hyoscine
- Maintenance of adequate food intake, vitamins and electrolytes
- Mind diversion by engaging him physically and mentally in some occupation
- Psychotherapy to help develop personality, confidence and self-respect
- **Rehabilitation:**
  - It is a continuous process of weaning away the victims of drug dependency.

- Social rehabilitation and training for gainful employment are the most important components after weaning addicts away from dependence to prevent relapse.

Q6. Explain drug dependence and prevention strategies. *(SSUHSA, 2021; ABKUB, 2017; VKSUAB, 2019; TDMGRMU, 2011, 2015; MUHS, 2019; TRIU, 2023)*

Ans: Drug dependence defined as **"A state, psychic and sometimes also physical, resulting from the interaction between a living organism and a drug, characterized by behavioral and other responses that always include a compulsion to take the drug on a continuous or periodic basis in order to experience its psychic effects, and sometimes to avoid the discomfort of its absence".**

Causes of drug dependence	*Prevention strategies*
Alcohol, opioids	Educational approach
Barbiturates, cannabinoids, cocaine	Community approach
Hallucinogens	Legal approach
Tobacco	Treatment
Volatile solvents	Rehabilitation

Q7. Explain factors associated with high risk for drug abuse. *(MGUB, 2022; TDMGRMU, 2014; SMU, 2010, 2012; ABKUB, 2017)*

Ans: Drug abuse is defined as "self-administration of drug for nonmedical regions, in quantities and frequencies which may impair an individual's ability to function effectively and which may result in social, physical or emotional harm".

Factors associated with high risk of drug abuse are:
- Unemployment, living away from house, broken home—one parents family
- Relaxed parental control, alienation from family
- Early exposure to drugs, areas where drugs are sold, traded or produced
- Leaving school early, large urban environments, areas with high rate of crime, areas with are drug using gangs/transit
- Related to certain occupations (tourism, drug production or sale)

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Which of the following drugs causes physical dependence?** *(ABKUB, 2021)*
   a. Alcohol b. Amphetamine c. LSD d. Cannabis
2. **Which drug addiction is considered the worst from of suffering?** *(YSRUHSAP, 2023)*
   a. Alcohol b. Amphetamine c. Barbiturate d. Cannabis
3. **The risk of being involved in a crash increases significantly above a blood alcohol concentration (g/dL):** *(YSRUHSAP, 2023)*
   a. 0.01 b. 0.04 c. 0.06 d. 0.10
4. **Intelligence quotient in case of imbecile is in the range of:** *(GITAMAP, 2023)*
   a. 0–24 b. 80–89 c. 50–69 d. 24–49
5. **Intelligence Quotient (IQ) is:** *(TRIU, 2023)*
   a. Mental age/Chronological age × 100
   b. Mental age–Chronological age × 100
   c. Chronological age/Mental age × 100
   d. Chronological age–Mental age × 100

6. **Profound mental retardation (IQ) is:** (KIMS, 2024)
   a. <20 b. 20–34 c. 35–49 d. 50–70

7. **A state in which individual requires higher dose than normal to induce a given response is:** (KIMS, 2022)
   a. Drug addiction b. Psychic dependence c. Tolerance d. None of the above

8. **The factors associated with high risk of drug abuse is:** (SSUHSA, 2024)
   a. Broken homes b. Living away from home
   c. Unemployment d. All of the above

Answers:

1.	d	2.	c	3.	b	4.	d	5.	a	6.	a	7.	c	8.	d

FILL IN THE BLANK (MENTAL HEALTH)

1. 'Moron' is one with IQ of _____. (SAMU, 2015)

Answer:

1. 51–70

APTER

16

Health Planning and Management

Q.1: Define and describe the concept and steps of health planning.

Q1 Define and describe the concept and steps of health planning.

Concept of planning:

- What?
- When?
- Where?
- Why?
- Whom?
- How?

Ans: Planning essentially means what needs to be done, how and when it has to be done; by whom and with what resources? The planning means a blueprint or a written protocol that guides our action **(Fig. 16.1)**. **"Good plans shape good decisions."**

The planning involves a succession of steps which are collectively known as planning cycle. *(KIMS, 2021)*

A. **Analysis of the health situation:**
   - Age and sex distribution of population
   - Morbidity and mortality data
   - Epidemiology and geographic distribution of different diseases
   - Medical care facilities like hospitals and other agencies
   - Various manpower available
   - Training facilities
   - Felt need of the population

Fig. 16.1: Planning process.

B. **Establishment of objectives and goals:**
   - After analyzing the health demands and health needs of the population the objectives and goal should be set up. These objectives should be at all levels of organization down to the smallest functional unit. Time and resources should be taken into account before setting up the objectives.
   - The objectives tend to be general at upper level but as the levels successively lower, they become more specified and detailed.
   - The objectives guide the efforts and serve as a yard stick to measure the work done by means of cost-benefit analysis and input-output study of health services.
   - They are also important to prevent haphazard unplanned use of funds.

C. **Assessment of resources:**
   - Resources are manpower, money and materials, skills, knowledge needed for implementation of a health program.
   - The availability of resources is very important for setting up objectives.

D. **Fixing priorities:**
   - Depending upon magnitude of health problems priorities should be fixed up

- While fixing priorities, attention should be paid to financial constraints. Among the mortality, morbidity data and prevalence of diseases, first consideration is which problem can be tackled at lesser costs, save lives of younger people also political and community interests should be taken into account
- Once priorities have been established, alternate plans for achieving them also formulated and assessed for their practicability and feasibility.

E. **Write up of formulated plan:** After plan is built following information is very important:
- Resources required
- Expected result
- Definition of cost of each stage
- Time required for each stage
- Working guidance to all the people responsible for its execution
- An inbuilt system of evaluation
- Modification can be done as per direction of higher authority and consideration of allocated resources

F. **Programming and implementation:**
- Definition of roles and tasks
- Selection, training, motivation, and supervision of the manpower involved
- Organization and communication

Sometimes there are shortcomings like:
- Delay in supply
- Lack of fund
- Inadequate staff
- Communication gap

If the above problems are identified, then it should be overcome.

G. **Monitoring:**
- Monitoring is a continuous day-to-day process of observing, recording and reporting of activities of or project during stage of implementation to ensure that they are proceeding as planned and are on schedule.
- It thus identifies any deviations from plan and helps to take corrective measures if excessive deviations occur.

H. **Evaluation:**
- Evaluation assesses the desired objectives have been attained.
- It concerned with final outcome
- A good plan has built-in evaluation
- Evaluation measures the degree to which objectives and targets are fulfilled and quality of the results obtained.

Significance: The importance of planning can be summarized that **"A well-planned work is half done."**

CM16.2: Describe planning cycle.

Q2. Define planning, administration, management, goals, objectives, target and describe briefly the planning cycle. Write in detail the various steps involved in planning cycle.

(AKUB, 2022; AFUH, 2022; 2023; ABKUB, 2017; 2024; VKSUAB, 2019; TRIU, 2021, 2023; KIMS, 2022; 2023; PBDSUHSH, 2017; TDMGRMU, 2013, 2014; RGUHS, 2008, 2011; RUJH, 2017, 2023; SAMU, 2011, 2022; BUMP, 2012; NU, 2014, 2015; DU, 2016; MUHS, 2019; VNSGUS, 2023; SSUHSA, 2023; MGUB, 2023; DBRAUA, 2024)/**Goals and objectives are not synonymous-explain.** *(WBUHS, 2022)* **Planning and management is not synonymous** *(WBUHS, 2023)*

Ans: Planning: It consists of formulation of action plan, execution (evaluation), monitoring, evaluation and modification if necessary **(Fig. 16.2)**.

Administration: It is broadly means, "getting thing done".

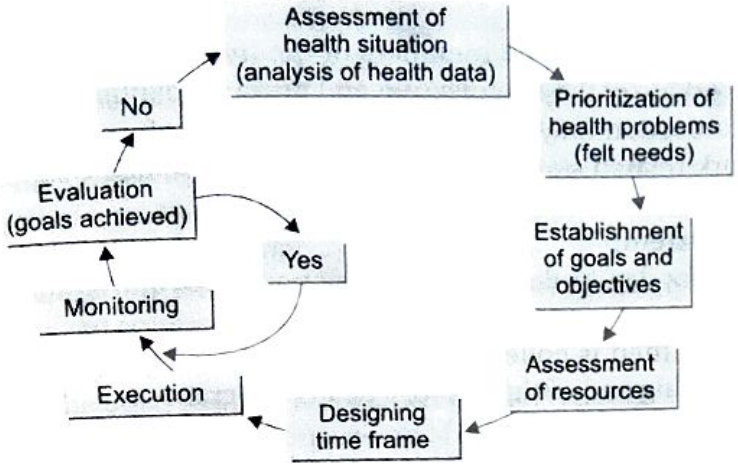

Fig. 16.2: Planning cycle.

Management: Management is defined as purposeful and efficient use of resources (manpower, materials and finances) in an organized manner for achieving the predetermined objectives. *(AFUH, 2023)*

Difference between administration and management:

Points of difference	*Administration*	*Management*
Main purpose	Efficiency	Effectiveness
Level of authority	Centralized (top level)	Decentralized (lower level)
Task defined	In-job description	By the situation
Main activities	Policy formulation and giving guidance	Execution of plan of a program

Goals: Ultimate desired state towards which objectives and resources are directed. A goal is usually desired in terms of:

- What is to be attained
- The extent to which it is to be attained
- The population or section of the environment involved
- Geography of the area
- Time required for attaining the goal

Objectives: It is the planned endpoint of all activities. It is described through **SMART** concept. Objectives should be **S (Specific), M (Measurable), A (Attainable), R (Realistic), T (Time-bound)**.

Target: It permits concept of degree of achievement for a single job.

The planning involves a succession of steps which are collectively known as planning cycle.

LM16.3: Describe health management techniques.

Q26. **Discuss qualitative and quantitative methods of health management.** *(WBUHS, 2023; ABKUB, 2009; TDMGRMU, 2009, 2013; RGUHS, 2012; GITAMAP, 2023)*

Ans: Qualitative method of health managements (based on behavioral sciences)

- **Organizational management:**
  - It deals with design of structure of organization which meets the health needs of the people by utilizing available resources
  - It should be reviewed from time to time depending upon the changing concept and evaluation process.
- **Personnel management:** It involves meaningful and skillful use of human resources by proper method of selection, training, placement, followed by division of responsibility and workload, opportunities for promotion and professional advancements and also incentives for better work.

- **Communication:**
  - Better communication among the members of the health team both in public and private sectors ensures efficient working of the organization and prompt healthcare delivery.
  - Barriers in communication may cause decrease in quality of workload by delay in regular reporting, compilation of work-related statistics, delay in release in salaries, supplies as well as delay in taking appropriate measures for betterment.
- **Health information system:**
  - Information is must for day-to-day health care management and should be available from both formal and informal sources
  - The information obtained is collected, classified, stored, transmitted, retrieved, transformed and displayed for monitoring and evaluation of a health program
- **Management by objectives (MBO)** *(DU, 2015; TRIU, 2023)*
  - It is the process where all managers hold meetings identify common goal of the organization and define responsibility of all members and assess the contribution of each member.
  - The health team can be divided into subunits for administrative convenience.
  - These subunits plan their activity accordingly

Steps in MBO:
- Setting goals
- Identify different units and subunits
- As per the resources available and target the units formulate a plan of action
- A periodic feedback system followed if objectives need modifications
- Appraisal done at the end of the program

Quantitative methods of health management: *(GOAU, 2022)*

- **Cost-benefit analysis:**
  - The amount of money spent for intervention is calculated followed by measurement of output of intervention in monetary units.
  - The course of action that gives the highest monetary returns for the lowest investment is regarded the best one.
- **Cost effective analysis:**
  - Benefits are expressed in terms of results achieved.
  - It measures the degree of attainment of predetermined objectives and targets.

Procedure:
- Define the objectives of the program
- Identify the possible ways to achieve objectives
- Calculate the cost of each method and effectiveness of each method
- Implement the best method selected out of all possible.

- **Cost accounting:** It is the method of calculation of cost of a health program or any health intervention.

Methods:
- *Input method:* The inputs can either capital investment in the form of one-time purchase of articles or recurring costs.
- *Function or activity:* Here cost is calculated by the money spent on activities such as training, management, supervision, evaluation, monitoring, etc.

Applications:
- It is a preliminary stem in cost-benefit and cost-effective analysis
- Creates awareness about the financial aspects of the program
- Comparing cost of different programs
- Calculation the cost of different components of the program
- Helps in making cost projections

- **Input and output analysis:** It is a management technique having two components.
  1. **Input:** It refers to all resources of the program like manpower, money, materials and time.
  2. **Output:** It refers to the benefits derived from the intervention like number of lives saved, etc.

  Steps:
  - Estimate the inputs required for interventions
  - Calculate the output in terms of cost-effective analysis
  - Express the analysis in a tabular format
- **Model:** Model or simulation study is a basic concept of management science and is a symbolic representation of idealized system and an abstraction of reality.

  Advantages:
  - It enables to predict the outcome by a known mix of interventions
  - It also provides a view of the effect of the course of action on the system.

  Disadvantages: The assumptions about results are made on the basis of stability of variables which is impractical.
- **System analysis:** It is the management tool for finding the cost effectiveness of a course of action.

  Objectives: Help the decision makers to choose an appropriate course of action and find cost effective alternatives.

  Steps:
  - Identification of problem
  - Investigation of problem
  - Searching for objectives
  - Finding alternative solutions
  - Evaluation of alternatives for cost effectiveness
  - Re-examination of objectives if necessary
  - Identification of most cost-effective alternatives
- **Network analysis (Fig. 16.3)** *(WBUHS, 2023; SMU, 2013; RUJH, 2015; DU, 2016; NU, 2012, 2016; VBUJH, 2023; SDVPG, 2023)*

  It is a graphic plan of all events and activities to be completed within fixed time to reach and desired objectives.

  Types:
  - Program Evaluation Review Technique (PERT)
  - Critical Path Method (CPM)

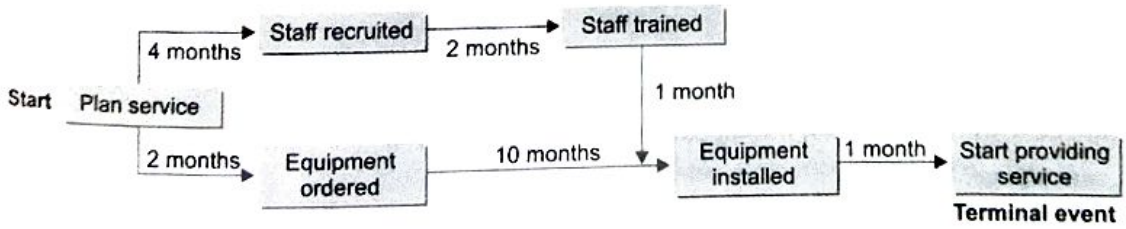

Fig. 16.3: Network analysis.

Q25. Describe Program Evaluation Review Technique (PERT). *(KIMS 2014; BNMUB, 2018; RUJH, 2018, 2021; ABKUB, 2018)*

Ans: It is a management technique enabling more detailed planning along with supervision of activities.

Example: Housewives plan the mean in such a manner that each item of menu completed within the time frame.

Components:
- Arrow diagram with logical sequence

- Calculating time of each activity
- Minimize delays at any point of activities
- Better communication between the mentioned activities
- Identifies problems
- Furnishing continuous and timely performance report
- In built planning, scheduling and monitoring

Critical Path Method (CPM) *(SAMU, 2016; DU, 2015; RUJH, 2009, 2018)*

- It is the longest path of a network
- Emphasis mainly on activities
- Usually applied to projects that are repetitive in nature

Comparison between PERT and CPM *(RUJH, 2021)*

Characteristics for comparison	*PERT*	*CPM*
Meaning	It is a project management technique, used to manage uncertain activities of a project. A technique of planning and control of time	It is a statistical technique of project management that manages well-defined activities of a project. A method to control cost and time
Orientation	Event oriented	Activity oriented
Model	Probabilistic model	Deterministic model
Focuses on	Time	Time cost trade off
Estimates	Three-time estimates	One-time estimate
Management	Unpredictable activities	Predictable activities
Critical and noncritical activities	No differentiation	Differentiated
Suitable	Research and development project	Non-research projects like civil construction, ship building, etc.

Significance: Any delay in activity along with critical path will result in delay of entire projects.

Planning-Programming-Budgeting System (PPBS)

It is the system which helps the policy maker to allocate resources to an organization for most effective use in order to achieve objectives in cost effective manner.

Components:

- It focused on defined specific objectives
- It always searches for alternatives on cost-benefits analysis
- Future cost should be taken into account

Work sampling:

- It is a systematic observation and recording of activities of one or more individuals carried out at a random interval.
- It provides quantitative measurements of various activities performed and time required for the same.
- It helps in judging the efficiency of current staff and appropriateness of his/her jobs description and training.
- It helps in standardizing the methods of performing job and determining the required manpower for the organization.

Decision making:

- It involves taking decisions about developments of resources, optimum workload for medical and paramedical workers, strategies for providing health care, etc.
- It is done at the level where the best decisions can be made, and it is made only after obtaining complete data.

Q. Describe health planning in India and National policies related to health and health planning.

Ans: Health planning in India:

(RGUHS, 2008)

Five-Year Plan

5-year plans are being formulated by National Planning Commission. The first 5-year plan was developed for the years 1951–1956 and currently 12th five-year plan (2012–2017) is being implemented.

Objectives:

- To ensure balanced development of all parts of the country
- To rebuilt rural India
- To lay foundation of industrial progress
- For better utilization of available manpower and upliftment of economic condition of the country through:
  - Control or eradication of major communicable diseases
  - Strengthening of the basic health services through establishment of primary health centers and subcenters
  - Population control
  - Development of health manpower resources

Overview of twelve five-year plan: To improve the health status of the population by optimizing coverage and quality of care by identifying and rectifying the gaps in infrastructure, manpower, equipment, essential drugs and reagents.

Strategy: Improve access to and enhance the quality of primary health care in urban and rural areas by providing an adequate functioning of primary health care system. Improve the quality of existing health care infrastructure at primary, secondary and tertiary care settings through improvement of referral services and linkages.

Targets:

Parameter	*Goal*
Infant mortality rate	25 per 1,000 live births
Maternal mortality ratio	100 per 10,000 live births
Total fertility rate	2.1
Malnutrition under 3 years	Reduction by 50%
Anemia in 15–49 years old women	28%
0–6 years child sex ratio	950
Communicable disease burden	
Tuberculosis	Reduce incidence and mortality by 50%
Leprosy	<1/10,000 Incidence zero in all districts
Malaria	Annual malaria incidence <1/1,000
Filaria	Microfilaria prevalence <1% in all districts
Dengue	Case fatality rate <1%
Chikungunya fever	Containment of outbreaks
Japanese encephalitis	Mortality reduction by 30%
Kala-azar	Elimination by 2015 (<1/10,000 in all blocks)
HIV/AIDS	• Zero new infections • Care and support • ART to all PLHA

(ART: antiretroviral therapy; PLHA: people living with HIV/AIDS)

Q4. Describe Bhore Committee. *(RGUHS, 2014; TDMGRMU, 2010,2011, [illegible] ABKUB, 2018; GOAU, 2021, [illegible])*

Ans: Bhore committee or Health Survey and Development Committee was appointed by Government of [illegible] under the chairmanship of **Sir Joseph Bhore in 1943** to survey the existing position regarding the [illegible] conditions and health organization in the country and make recommendations for the future development. **In 1946, the committee submitted its 4 volume report,** putting forward a comprehensive proposal for the development of a national program of health services for the country.

Observations: The committee observed that "if the nation's health is to be built, the health program should be developed on a foundation of preventive health work and such activities should proceed side by side with those concerned with the treatment of patients."

Recommendations:

- Integration of preventive and curative services at all administrative levels.
- It virtualized the development of primary health centers in two stages:

A. **Short-term measures:** Each primary health center in the rural areas should cater to a population of [illegible] with a secondary health center to serve as a supervisory, coordinating and referral institution.

Staffing pattern of each PHC:

Position	*Number*
Medical Officer	2
Public Health Nurse	4
Nurse	1
Midwife	4
Trained dai	4
Sanitary Inspector	2
Health assistant	2
Pharmacist	1
Class IV Employee	15

B. **Long-term program (3 million plan):** Setting up primary health units with 75 bedded hospitals each 10,000 to 20,000 population and secondary units with 650 bedded hospitals again recognized around district hospitals with 2,500 beds. Major changes in medical education which includes 3 months training in preventive and social medicine to prepare "Social Physicians."

Significance: The Bhore Committee provided guidelines for National Health Planning in India through its concept of primary health center functioning as focal point for providing a package of comprehensive health care, comprising preventive, promotive and curative services.

Q5. Describe Recommendation of Mudaliar Committee. *(TDMGRMU, 20[illegible])*

Ans: Mudaliar committee or Health survey and planning committee was appointed by Government of India in the year 1959 under the chairmanship of DR AL Mudalior.

Objectives: To review the progress made after the submission of Bhore Committee report and to make recommendations for future.

Main observation: Inadequate quality of services was provided by the PHCs due to lack of sufficient facilities.

Recommendations:

- Consolidation of advances made in the first two five-years plan.

- Strengthening of the district hospital with specialized services to serve as central base of regional services.
- Regional organizations in each state between the headquarters organization and the district in charge of a Regional Deputy or Assistant Directors each to supervise 2 or 3 district medical and health officers.
- Each primary health center not to serve more than 40,000 population
- Improve the quality of health care provided by the primary health centers
- Integration of medical and health services as recommended by Bhore committee.
- Consolidation of an all-India Health service on the pattern of Indian Administrative Service.

Q6. Write Recommendation of Kartar Singh Committee. *(TDMGRMU, 2011)*

Ans: Katar Singh Committee or the committee on multipurpose workers under Health and Family planning was appointed by Government of India in 1972 under the Chairmanship of Kartar Singh, Additional Secretary, Ministry of Health and Family Planning.

Objectives:
- To study the structure for integrated services at peripheral and supervisory level.
- To assess the feasibility of having multipurpose/bipurpose workers in the field.
- To recommend the training requirement of such personnel.
- To study and recommend utilization of mobile service units set up under family planning program for integrated medical, public health and family planning services.

Recommendations:
- The term Auxiliary Nurse Midwives are replaced by Female Health worker and the term Basic health workers, Malaria surveillance workers, Health Education assistants (Trachoma) and Family planning Assistants by Male Health workers.
- The program for having multipurpose workers to be first introduced in areas where malaria in maintenance phase and smallpox has been controlled and later to other areas as malaria passes into maintenance phase or smallpox controlled.
- For proper coverage, there should be one primary health center for a population of 50,000.
- Each primary health center should be divided into 16 subcenters each having a population of about 3,000 to 3,500 depending upon topography and means of communications.
- Each subcenter should be staffed by a team of one male and one female health worker.
- There should be a male health supervisor to supervise the work of 3 to 4 male health workers and a female health supervisor to supervise the work of 4 female health workers.
- Lady health visitors to be designated as female health supervisors.
- The doctor in charge of a primary health center would be the overall in charge of supervisors and health workers under his/her catchment area.

Q7. Discuss Shrivastav Committee, 1975. *(RGUHS, 2009, 2010; TDMGRMU, 2012)*

Ans: Shrivastav Committee or Group on Medical Education and Support Manpower was appointed by the Government of India in 1974 under the chairmanship of Dr JB Shrivastav, Director General of Health Services, Government of India. The said committee submitted its report in April 1975.

Objectives:
- To study the medical education and healthcare delivery system in India.
- To devise a suitable curriculum for training a cadre of health assistants so that they can serve as a link between the qualified medical practitioners and multipurpose workers, thus, forming an effective team to deliver health care, family welfare and nutritional services to the people.
- To suggest steps for improving the existing medical education processes as to provide due emphasis on the problems particularly relevant to national requirements.
- To make any other suggestions to realize the above objectives and matters incidental thereto.

Recommendations:

- Creation of band of paraprofessional and semi-professional health workers from within the community like teachers, postmasters, gram sevaks, etc., to provide simple preventive, promotive and curative services to the community.
- Establishment of two cadres, namely multipurpose health workers and health assistants between community health workers and medical officers at primary health centers.
- Development of a referral services complex by establishing proper linkage between the primary health centers and higher referral centers.
- Establishment of Medical and Health Education commission for planning and implementing reforms needed in health and medical education on lines of University Grants Commission.
- Re-orientation of Medical Education (ROME) to medical students and health workers.
- Introduction village guide scheme.
- Establishment of three tier rural health infrastructure (Panchayat - Panchayat Samity - Zilla Parishad).

CM16.4: National policies related to health and health planning.

Q8. Discuss National Health Policy-2017. (SD1PG 2023)

Ans: National Health Policy **(NHP)** of 1983 and 2002 have served well in guiding approach for health sector five-year plans. The situation has changed after 15 years of last health policy in the following ways:

- Health priorities are changing
- Growing burden of noncommunicable and some infectious diseases
- Emergence of a robust healthcare industry
- Growing incidence of catastrophic health expenditure due to health care costs, leading to poverty
- Rising economic growth enables enhanced fiscal capacity
- Important change in Sustainable Development Goals (SDGs)

So, contextual changes are required in the new health policy. NHP 2017 builds on the progress made since the last NHP 1983 and 2002 respectively. As health is a state responsibility, States play key role in its implementation.

- **National Health Policy, 2017—Goals and Objections:**

Goals:

- Attainment of the highest possible level of health and well-being for all at all ages and achieve "Sustainable Development Goals" of United Nations by 2030.
- Progressively achieve universal health coverage

General Objectives:

- Assuring availability of free comprehensive primary healthcare services, for all aspects of reproductive, maternal, child and adolescent health and for most prevalent communicable and noncommunicable diseases and occupational diseases in population
- Improved access to affordable, quality secondary and tertiary healthcare through combination of public and private providers
- To achieve reduction in out of the pocket expenditure and catastrophic health expenditure.
  - Reinforcing trust in public health care system
  - Align the growth of private care sector with public health goals

- **Specific Objectives of NHP' 2017:**

A. **Health status and Program impact by 2025:**

- Increase life expectancy at birth from 67.5 to 70 years
- Reduction of total fertility rate to 2.1
- Reduce under five mortality rate to 23
- Reduce maternal mortality ratio to 100
- Reduce infant mortality rate to 28
- Reduce neonatal mortality rate to 16 and still birth rate to single digit

Reduction of disease burden (Prevalence and Incidence)

- Achieve global target of HIV/AIDS by 2020 as termed 90:90:90, i.e., 90% of all people living with HIV know their HIV status, 90% of all people diagnosed with HIV infection and 90% of all people receiving ARV therapy.
- Achieve and maintain elimination of Kala-azar and Lymphatic filariasis by 2017 and Leprosy by 2018
- Achieve cure rate of TB of over 85% in new sputum positive patients, reduce incidence and reach elimination status by 2025
- To reduce prevalence of blindness to 0.3%
- To reduce premature mortality from cardiovascular diseases, cancer, diabetes and chronic respiratory diseases by 25% by 2025

B. **Health system performance:** Coverage of health services by 2025:

- Increase utilization of public health facilities by 50% from current level
- Achieve antenatal care coverage above 90%
- Skilled attendance at birth above 90%
- Coverage of fully immunized infants above 90%
- Meet family planning need above 90%
- 80% of known hypertension and diabetics at household level maintain controlled disease status

Health related cross sectional goals:

- Reduce prevalence of tobacco use by 15% by 2020 and 30% by 2025
- Reduce prevalence of stunting by 40% in under five children
- Access safe water and sanitation to all by 2020 (Swachh Bharat Mission)
- Reduction of occupational injuries by half from current level of 334 per lakh by 2020

C. **Health system strengthening—Health finances:**

- Increase health expenditure by Government as percentage of GDP from existing 1.15 to 2.5% by 2025
- Increase State health sector spending to more than 8% of their budget
- Decrease in proportion of households facing catastrophic health expenditure from current levels by 25% by 2025

D. **Health infrastructure and human resources:** Provide Paramedical and Doctors as per IPHS or national norms in priority districts.

E. **Health management information system:** Ensure district level electronic database and strengthen surveillance system

- **Policy Thrust Areas:**
  - Raising public health expenditure to 2.5% of GDP in time bound manner
  - *Preventive and promotive health:* Coordinated action on seven priority areas for improving the environment for health:
    - Swatch Bharat Abhiyan
    - Balanced healthy diets and regular exercise
    - Addressing tobacco, alcohol and substance abuse
    - Yatri Suraksha- preventing death due to rail, road traffic accidents
    - Nirbhay Nari; action against gender violence
    - Reduced stress and improved safety at workplace
    - Reduce indoor and outdoor air pollution
  - *Organization of public health care delivery:* The policy proposes seven key policy shifts in organizing health care services:
    - In primary health care—from selected care to assured comprehensive primary health care with linkages to referral hospitals for continuity of services.
    - In secondary and tertiary care—from an input-oriented budget line financing to an output based strategic purchasing from public/private hospitals.
    - In public hospitals—from user fees and cost recovery to assured free drugs, diagnostics and emergency services to all.

- In infrastructure and human resource development—from normative approach to targeted approach to reach under-serviced areas
- In urban health—from token interventions to on-scale assured interventions, to organized primary healthcare delivery and referral support for urban poor. Collaboration with other sectors to address wider determinants of urban health is advocated.
- In national health programs—integration with health systems for program effectiveness
- In AYUSH services—from stand alone to a three-dimensional mainstreaming (Co-location of AYUSH, availability of standard medicines and protocols and yoga)

- *Healthcare strategies:*
  - Free primary healthcare provision by public sector
  - Strategic purchase of secondary care, hospitalization and tertiary care services from both public and private (nongovernmental sectors) to fill critical gap
  - Mainstreaming of different health system (AYUSH)
- *Spectrum of services:*
  a. Free primary care services and continuity of care:
     ◊ Upgradation of existing subcenters and reorientation of PHCs to **"Health and wellness center"** to provide packages of compressive preventive, promotive, curative and rehabilitative services.
     ◊ Linking every family/household to primary healthcare facility package anywhere in the country
     ◊ Two-way systematic linkages between primary, secondary and tertiary services to ensure continuity of care
     ◊ Screening—early detection and response to early childhood development delays and disability
     ◊ Adolescent and sexual health education
     ◊ Behavior changes with respect to tobacco, alcohol and physical activity
     ◊ Counseling for primary prevention and secondary prevention for common chronic illness for communicable and noncommunicable diseases.
     ◊ School health, occupational health, tribal health to cover 100 million tribal population, urban health and control of zoonotic diseases
  b. Secondary care services:
     ◊ To provide secondary care at district and sub-district hospitals
     ◊ Two beds per thousand population distributed in such a way that it is accessible within golden hour rule with efficient emergency transport system
     ◊ Ten categories of specialist services/skills be available at district and 4–5 at sub-district hospital level
     ◊ Reorienting public hospital: Public hospitals would provide universal access to progressively wide array of free drugs, diagnostics and emergency services of high quality.
     ◊ Infrastructure and human resources/skill gaps: The policy follows roadmap of 12th five-year plan for managing human resources for health as per Indian Public Health Standards.
     ◊ Urban healthcare: Establish urban health centers and urban community health centers for urban poor/slum areas for comprehensive urban primary health services.

- **National Health Programs (NHPs):**
  - RMNCHA+ N, communicable and noncommunicable diseases, mental health, trauma centers and occupational health.
  - *Population stabilization:* Improve static services for family planning and increase men participation from less than 1% currently to 30% (specially sterilizations)
- **Women's health and gender mainstreaming:** Enhance provision for reproductive morbidities and health needs of women beyond reproductive age group, orientation of staff to gender sensitive and women friendly services and provide free services with dignity to victims of gender violence.
- **Supportive supervision:** Supportive innovative measures of supportive supervision in more vulnerable districts.

- **Disaster preparedness:** Timely response to disasters both man-made and natural.
- **Mainstreaming potentials of AYUSH:** Bridge courses for AYUSH to prepare workforce of mid-level care providers at the level of subcenter.
- **Tertiary healthcare services:** The policy affirms that tertiary care services are organized along the line of regional, zonal and apex referral centers. Government should set up new Medical College, Nursing Institutions and institutions like AIIMS. Government should be emphasized on PPP models with non-government sectors.
- **Human resources in health:**
  - Medical and paramedical education to be integrated with service delivery systems so that students learn in real environment and not just confines to medical school.
  - Medical education-strengthening existing medical colleges and converting district hospitals into new medical colleges to increase the number of doctors and specialists.
  - Revision of curriculum of UGs and PGs
  - Develop a cadre of mid-level service providers
  - Nursing education—improve regulations
  - Paramedical skills—training courses and curriculum for superspecialist paramedical care
  - Public health management cadre-creation of public health management cadre in all states
  - *Human resource governance and leadership:* Human resource management
  - Medical and nursing education and policies on recruitment, selection, promotion, posting, transfer and leadership skills for good governance.
- **Financing of health services:**
  - Allocation of major proportion of up to 67% or more of resources to primary health care followed by secondary and tertiary care. Public health accounts in health has been set up.
  - Strategic purchasing of secondary and tertiary health care to fill the critical gaps in services.
- **Collaboration of nongovernment sectors:** The policy advocates positive and proactive engagement with private sector for critical gap filling, towards achieving National public health goals.
  - Outsourcing of training of teachers as corporate social responsibility (CSR)
  - Primary health care services, engaging private hospitals for skill development, mental health care programs, disaster management, mental health care program, strategic purchasing of secondary and tertiary care from private sector, diagnostic services, ambulance services, referral services, immunizations, disease surveillance and notification, etc.
  - The private sector should be supported for skill upgradation and rational drug use and use of standard treatment protocols as also for "Make in India."
- **Regulatory framework:** Regulation of professional education through six professional councils, viz clinical establishments, food safety, drug regulation, medical devices, vaccine safety, medical technology, etc.
- **Essential drugs and diagnostics:** Promoting generic drugs and introduction of new technologies by Health Technology Assessment (HTA) besides a well-developed procurement system for drugs.
- **Health Research:** Increase investment in health research in the areas of health system and services research, medical product innovation, fundamental research, translation research, etc.
- **Governance:** Role of central and state governments and their accountability; directorates to be strengthened by human resources (HR) policies, those from public health management cadre must hold senior positions in public health. Involve PRIs and local bodies, encourage a community monitoring system.
- **Implementation framework and way forward:** The NHP 2017 envisages that an implementation framework be put in place to deliver on these policy commitments. It would provide a roadmap with clear deliverables and milestones to achieve the goals of the policy.

CM5.6: Enumerate and discuss National Nutrition Policy.

National Nutrition Policy: Chapter 5, CM5.6

National Population Policy: Please refer to Q.6b of Chapter 9.

SHORT NOTES AND RELEVANT QUESTIONS

Q9. Management consists of four basic principles—Explain. *(WBUHS, 2009)*

Ans: Management means the purposeful and effective use of resources—manpower, material and finances for fulfilling predetermined objectives. Management consists of following four activities:

1. **Planning:** Determining what is to be done.
2. **Organizing:** Setting up the framework or apparatus and making it possible for groups to do the work.
3. **Communicating:** Motivating the people to do the work.
4. **Monitoring (controlling):** This is checking to make sure that the work is progressing satisfactorily. Four basic principles are applied in any action of some activity to manage the job fruitfully.

Q10. Describe target and goal. *(BNMUB, 2010; RHUHS, 2010)*

Ans: Goals and targets are both important elements of planning. A goal is the ultimate desired state towards which objectives and resources are directed. Goals are broader than targets. Goals are formulated at the highest level to end the total activities. Targets are usually formed at a lower level for achieving this goal. Targets are highly specific jobs in comparison with goals which is the ultimate demand or end point of all activities.

A goal is usually described in terms of:

- What is to be attained?
- The extent to which it is to be attained.
- The population or section of the environment involved.
- The geographic area in which the proposed program will operate.
- The length of time required for attaining the goal.

Targets often refer to a discrete activity, such as number of blood films collected, no. of sputum test is done, no. of health education session is done, etc. Target permits the concept of degree of achievement.

Q11. Discuss prioritization is an important step in health planning—Justify/Priority is a prerequisite of planning. *(WBUHS, 2011, 2014, 2016, 2019, 2023; KIMS, 2016)*

Ans: Prioritization is an important step in planning cycle because in the developing countries like India, resources always fall short of total requirement. In fixing priorities, attention is paid to the following criteria in health sector.

Virulence of the disease: If the disease has a high case fatality rate, priority is given on controlling this disease.

Magnitude of the problem: If the disease is an important public health problem and affects a large number of people like ARI and diarrhea, that disease also receives priority.

Saving the lives of younger people: Younger people are economically productive group. If any disease mostly affects economically productive age group like tuberculosis that creates economic burden on country. So, these types of diseases also receive high priority.

Diseases which can be prevented at low-cost: There are some diseases, which can be prevented by several low-cost measures like health education and immunization and it provides large number of benefits. These types of diseases also receive high priority.

The diseases of social stigma like leprosy and, STD: Control of these types of diseases is also important, because of social stigma, care seeking behavior of these diseases is poor and they can spread the disease in the community.

Political and community interest and pressure: This is another issue for priority selection. Once priorities have been established, alternate plans for achieving them are also formulated and assessed in order to determine, whether they are practical and feasible.

Q12. Discuss feedback is very important in health planning. *(WBUHS, 2015, 2018, 2022; AKUB, 2022)*

Ans: Planning results in the formulation of a plan which is a blueprint for taking action. This requires objective formulation, policy framing, program implementation with proper scheduling and a good amount of budget.

Feedback completes planning by creating a cycle. Budget works as the backbone, and the schedule works in silence to accomplish the job in right time. Policy will guide the activities kept in plan.

Planning involves a succession of steps and these steps may overlap on some occasion.

a. **Analysis of the situation:** Health planning will analyze health situation which will include population and its structure, morbidity and mortality statistics, medical care manpower and infrastructure, culture, belief and attitude of population of that area etc. If these data are grasped and analyzed, then health need, resource, felt need and demand considering health problems can be brought out at surface to tackle the situation.
b. **Establishment of objectives:** Objectives are framed depending upon the problems identified, resource, peoples' belief and their participation. Then the activities taken for implementation will be guided in proper direction.
c. **Priority fixation:** Many kinds of problems will creep up, and all the issues may not be addressed at the same time due to a paucity of funds, manpower, skills, etc. So, a few important objectives will be chosen for action in the field. This selection of a few actions from a list of actions is prioritization. This will help the people achieve the objectives.
d. **Formulation of plan:** Detailed plan will be the next task. This plan will guide the health worker how to execute the work, monitor actions along the time.
e. **Implementation of the plan:** Programs are taken and these programs are executed in the community. All activities which are specifically defined are considered in terms of specification of time, cost, track of activities.
f. **Monitoring:** Every work requires monitoring to see the work whether the work is going according to plan. Deviation will be corrected as soon as the defects are identified.
g. **Evaluation:** Feedback is comes from this evaluation. Evaluation of input, process and outcome can be taken as an important issue. If the outcome is good, feedback is good. The program taken may be continued. If the outcome is poor, feedback is poor. The program may be revised in part or as a whole. Objective settings may be different.

So, feedback is very important in any kind of health planning. Without feedback, planning will not be successfully implemented. Feedback will guide the planner whether the plan is fruitful or useless. Feedback is thus becomes essential part of a complete planning cycle.

Q13. What is SWOT analysis? *(SAMU, 2015)*

Ans: SWOT analysis of National Tuberculosis Elimination Program (NTEP).

Strengths:

- High-level political and administrative commitment providing fresh impetus to TB elimination efforts in the country
- Deliberate efforts to move away from routine and set aspirational goals, targets with strategies and actions to match
- Availability of new drugs, reagents, diagnostics, approaches and strategies to end TB

Weakness:

- Many communities have been poorly served by a one-size policy prescription as TB epidemiology is diverse in India
- TB program structure unable to cope with the growing demands for ending TB
- Limited human resources at the central TB division which severely limits program management at the National level
- Private sector involvement in public health actions related to TB control is not commensurate with its size and dominance in TB care

Opportunities:

- Aggressive research agenda driven by the research consortium including clinical trials for new drugs, vaccines and genomic studies provides unheralded potential for TB control

- In-country innovations and pilots with potential for replication and scale up
- SDGs and End TB strategy provide ambitious targets to aim

Threats:

- Amplification of drug resistance
- Insufficient budgetary outlay for health in the national budgets compromising the allocation to TB
- Variable implementation capacity. Capacity and ownership of the states
- Loss of independent, third party, technical assistance from development partners.

Q14. What are the components of the evaluation process? (WBUHS, 2018)

Ans: The step/components of evaluation process of a health program/Services/Institutions by WHO are as follows:

- Specify the subject of evaluation
- Ensure information support
- Verify relevance
- Assess adequacy
- Review progress
- Assess efficiency
- Assess effectiveness
- Assess impact

Specify the subject of evaluation: The objective of a program or service must be explicitly stated for evaluation to be carried out. The purpose of evaluation, the organizational levels at which it is to be carried out, and the possible constraints should be clear.

Ensure information support: The information requirements, available resources of information and their adequacy and accuracy should be determined. If necessary, special studies or surveys need to be carried out for collecting the necessary information.

Verify relevance: Relevance is related to the rationale of planning and implementing programs, activities and services in terms of their responding to essential human needs and social and health policies and priorities. A program may be considered as relevant if it is consistent with national policy, makes significant contribution for promotion of health, prevention of diseases and improving the quality of life or meets community needs. The relevance of certain programs may differ from region to region.

Assess adequacy: Adequacy is related to sufficient attention being paid to certain previously determined courses of action. It is to be found out if the problems have been clearly defined with reference magnitude, severity, interference with learning or work potential. Assess if program has clearly defined objectives, stated time frames, clear administrative responsibilities, optimum use of resources with inbuilt evaluation system.

Review progress: Progress is related to a comparison of actual with scheduled activities. Significant departures and shortcomings with their reasons should be noted. Numerically stated targets will be necessary and useful for such a comparison.

Assess efficiency: Efficiency is related to a comparison between the effects of an activity or health program in relation to the resources spent in terms of money, material and time. Cost-benefit analysis will be useful for this purpose. Find out if optimal utilization of available resources is being made or if there is nonutilization or underutilization.

Assess effectiveness: Effectiveness is related to the desired effect of a program, service, institution or activity in bringing about reduction of a health problem or improvement of health situation. Find out the attainment of objective in terms of improved health situation or reduction of problems. The definition for targets and output indicators during planning itself will facilitate assessment of effectiveness. Reasons of failure to meeting objectives and attaining targets should be studied.

Assess impact: The question to be answered is that even if the objectives of the program are being attained, has the result been an improvement in overall health and socioeconomic situation and quality of life.

Describe budgeting. *(WBUHS, 2019)*

Ans: **Budgeting** is the process of creating a plan to spend your money. This spending plan is called a budget. Creating this spending plan allows you to determine in advance whether you will have enough money to do the things you need to do or would like to do. Budgeting is simply balancing your expenses with your income.

A **budget** is a financial plan for a defined period, often one year. It may also include planned sales volumes and revenues, resource quantities, costs and expenses, assets, liabilities and cash flows. Companies, governments, families and other organizations use it to express strategic plans of activities or events in measurable terms.

A budget is the sum of money allocated for a particular purpose and the summary of intended expenditures along with proposals for how to meet them. It may include a budget surplus, providing money for use at a future time, or a deficit in which expenses exceed income.

A budget (derived from the old French word meaning purse) is a quantified financial plan for a forthcoming accounting period.

A budget is an important concept in microeconomics, which uses a budget line to illustrate the trade-offs between two or more goods. In other terms, a budget is an organizational plan stated in monetary terms.

In summary, the purpose of budgeting tools:

- Tools provide a forecast of revenues and expenditures, that is construct a model of how a business might perform financially if certain strategies, events and plans are carried out.
- Tools enable the actual financial operation of the business to be measured against the forecast.
- Lastly, tools establish the cost constraint for a project, program, or operation.

Q16. What is zero budget approach? *(BNMUB, 2014; ABKUB, 2005)*

Ans: Many companies use some form of zero-based budgeting, which is a budgeting process where no amounts carry over from prior years and no programs are considered pre-approved.

Zero-based budgeting is a budgeting method where every expenditure must be justified in every budget cycle. When the company begins a budget process, they start from zero. Each department must request funds via a detailed plan describing what each allocation of funds will be used for and what benefits the company will receive from it.

Budgeting Process:

The first step: One will be asked to put together a budget for your department for the upcoming year. It will need to include all costs for your department including salaries, travel, and supplies. He will also need to justify these costs by explaining exactly what the company will get from those expenditures.

The next step: Once one has turned in his budget, he'll probably be asked to present it to a group including senior management and the budgeting staff. He'll present his numbers and justification, and then he'll answer questions about the amounts he is requesting. Sometimes, companies will reduce or eliminate line items during the meeting if management doesn't feel the expenses are necessary.

The final step: Once all the meetings are done, the budget staff will adjust budgets based on direction from senior management. They will then provide a final consolidation to management for approval. Once it's approved, the budget for his department will be sent back to him, and he can begin planning based on his final approved plan.

Advantages: The primary advantage of zero-based budgeting is that each cost is re-evaluated each year. Perhaps the company has cable service for its conference rooms, but now uses its broadband wireless to show videos during meetings. A company that bases its budget on prior year actual costs might continue to pay for the service, not realizing it's no longer needed. In zero-based budgeting, every expenditure is revisited, so that anything not contributing to the company's current objectives can be eliminated.

Q17. Cost-effective analysis and cost-benefit analysis are not synonymous—Explain. *(WBUHS, 2013, 2019, 2023, 2024; BUMP, 2012; DU, 2014; PBDSUHSH, 2013)*/**Cost-effective analysis is more suitable than cost-benefit analysis in health sector.** *(WBUHS, 2018; AFUH, 2023; MGUB, 2023; SDVPG, 2023)*

Ans: Cost-effective analysis in health (CEA) *(WBUHS, 2016, 2021; GNSUB, 2022; BNMUB, 2018; SAMU, 2022)* On the other hand, cost-effectiveness analysis is a more promising tool for application in the health field than cost-benefit analysis. It is similar to the cost-benefit analysis except that benefits, instead of being expressed in monetary terms, is expressed in terms of results achieved, e.g., number of lives saved or the number of days free from disease. In cost-effective analysis, outcomes are measured in natural units. Outcomes are one-dimensional.

Clinical outcomes: Diseases cured; Diseases prevented; Lives saved; Years of lives saved.

Technique: Unit cost against measurable quantitative benefit is calculated and compared, as for example, the following shows the unit cost of a program against measurable effect of reducing IMR.

Program	*Per capita expenditure*	*Reduction of IMR*
Immunization (full coverage)	₹ 25/-	10%
ORT	₹ 35/-	10%
Nutritional supplementation	₹ 65/-	10%
Safe water and sanitation	₹ 145/-	10%

Q18. Discuss the cost-benefit analysis (CBA).
(WBUHS 2022; BNMUB, 2018; SMU, 2015; KIMS, 2021, 2023; SSUHSA, 2023)

Ans: In cost-benefit analysis, the economic benefit of any program is compared with cost of the program. The benefits are expressed in monetary terms to determine whether a given program is economically sound and select the best out of several alternate programs.

$$\text{CBA} = \frac{\text{Cost in monetary term}}{\text{Benefits in monetary term}}$$

Essential steps of Cost-benefit analysis:
- Identification of costs and benefits
- Measurement of costs and benefits
- Valuation of costs and benefits

Example:

Program	*Expected benefit*	*Expected cost*	*Benefit: cost*
MCH	$21,0000	$35,000	6:1

The main drawback with the technique is that the benefits in the health field as a result of particular program cannot always be expressed in monetary terms.

Q19. Health economics. *(GOAU, 2022. MGUB, 2024)*

Ans: Health economics is used to promote healthy lifestyles and positive health outcomes through the study of health care providers, hospitals and clinics, managed care and public health promotion activities.

Health economics is an applied field of study that allows for the systematic and rigorous examination of the problems faced in promoting health for all.

Father of health economics: Kenneth Arrow and the birth of health economics

Principles: Health economics is a field that takes the basic ideas of economics:
- **Scarcity:** There are never enough resources to do all the things we would wish to

- **Opportunity cost:** Whenever we make a decision to invest in a service, we at the same time are also making the decision not to invest in something else, and

Objectives: Health economics is important because it focuses on how the economic behavior of stakeholders and recipients affects the quality and cost of medical care. It includes how people pay for care, how they are processed, and how health systems worldwide can be restructured and improved.

(MGUB, 2023)

NITI Aayog.

Ans: On 1 January 2015, a Cabinet resolution was passed to replace the Planning Commission with the newly formed NITI Aayog (National Institution for Transforming India). The Union Government of India announced the formation of NITI Aayog on 1 January 2015.

NITI Aayog or the National Institution for Transforming India is a policy think tank of the Indian government which provides inputs regarding the different programs and policies of the government.

CEO: An Indian Administrative Service Officer of the 1987 batch (Chhattisgarh cadre), Shri Subrahmanyam has held important assignments over the last three decades in Madhya Pradesh, Chhattisgarh, and Jammu&Kashmir, along with a stint at the World Bank.

NITI Aayog is based on the seven pillars of effective governance: (1) Pro-People (2) Pro-Activity (3) Participation (4) Empowering (5) Inclusion of all (6) Equality (7) Transparency.

The National Institution for Transforming India will act as a catalyst for the development by a holistic approach

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Set of statement for monitoring progress towards goal is referred as:** *(SAMU, 2016)*
   a. Target b. Objective c. Program d. Procedure
2. **Bhore Committee aimed at having health center with following number of medical officers:** *(ABKUB, 2007)*
   a. 2 b. 3 c. 4 d. 6
3. **Which of the following gave extensive recommendations regarding primary health care during British-ruled India?** *(ABKUB, 2019)*
   a. Bhore Committee b. Alma-Ata Conference c. Both of the above d. None of the above
4. **PHC was introduced as a result of _____ report:** *(VKSUAB, 2021)*
   a. Bhore Committee b. Katar Singh c. Mudaliar Committee d. Planning Commission
5. **Health Survey and Development Committee was given by:** *(ABKUB, 2017)*
   a. Mudaliar b. Bhore c. Srivasthava d. Mukherji
6. **All are true about Mudaliar Committee, *except*:** *(VKSUAB, 2021)*
   a. To improve the quality of health care
   b. Strengthening of district hospital
   c. Consolidation of advances made in first two five-year plans
   d. Each primary center covers a population of 80,000
7. **Management methods based on quantitative methods are all, *except*:**
   a. Model b. Cost-benefit analysis
   c. Cost-effective analysis d. Management by objectives
8. **Management methods based on qualitative/behavioral sciences include all of the following, *except*:** *(TRIU, 2023; AKUB, 2023)*
   a. Information system b. Organizational design
   c. Cost-effective analysis d. Personnel management

9. PERT technique is used in which of the following: *(ABKUB, 2018)*
a. Network analysis b. Cost effective analysis c. Input-output analysis d. System analysis

10. PERT means: *(AFUH, 2022, 2021)*
a. Gender analysis b. Network analysis c. Statistical analysis d. Problem analysis

11. The longest path of network is called: *(ABKUB, 2021)*
a. Program evaluation and review technique b. Critical path method
c. System analysis d. Input-output analysis

12. SWOT stands for all of the following, *except*: *(TRIU, 2021)*
a. Strength b. Weakness c. Opportunity d. Time-bound

13. NITI Aayog replaced the Planning Commission of India on: *(YSRUHSAP, 2021)*
a. 1980 b. 1997 c. 2000 d. 2015

14. The extent to which a specific healthcare intervention produces a beneficial result under ideal controlled conditions is its: *(RUHL, 2023)*
a. Efficiency b. Effectiveness c. Effect modification d. Efficiency

15. False about objective is: *(WBUHS, 2023)*
a. It is specific b. It is measurable c. May not be achieved d. It is realistic

16. The Planning Cycle has several steps: *(WBUHS, 2023)*
a. Monitoring and evaluation
b. Programming and implementation
c. Assessment of resources
d. Analysis of the existing situation
Logical sequence in the planning cycle would be:
a. **a, b, c, d** b. **d, c, b, a** c. **d, b, c, a** d. **c, d, b, a**

17. All of the following are steps of the planning cycle except: *(WBUHS, 2024; AKUB, 2024)*
a. Situation analysis b. Surveillance
c. Monitoring d. Establishment of goals and objectives

18. Planning in the broadest sense DOES NOT include which step: *(RUJH, 2023)*
a. Plan formulation b. Execution c. Evaluation d. Surveillance

19. In the critical path method of network analysis, the critical path is the: *(GNSUB, 2023; GOAU, 2023)*
a. Shortest b. Longest
c. Cheapest d. Costliest
e. Congested path in a network f. Most expensive path in a network

20. The management technique which is more promising tool for application in health field: *(WBUHS, 2023)*
a. Cost-effective analysis b. Cost-benefit analysis
c. Cost accounting d. Input-output analysis

21. The concept of Multipurpose worker was given by: *(GNSUB, 2023)*
a. Mudaliar Committee b. Srivastava Committee
c. Karter Singh Committee d. Mukherjee Committee

22. The National Health Policy of India has set the following goals *except*: *(GNSUB, 2023)*
a. To reduce IMR to below 30 per 1000 live births.
b. To reduce MMR to below 100 per 1,00,000 live births
c. 100 percent registration of births, deaths, marriages and pregnancies
d. To bring down the total fertility rate to replacement level by 2015

23. **Economic benefits of any program are compared with the costs incurred in:** (RNU, 2022)
a. Cost-benefit analysis
b. Cost effective analysis
c. Cost accounting
d. Network analysis

24. **Common type of network techniques are:** (KUHS, 2022)
a. Program evaluation review techniques (PERT)
b. Critical Path Method (CPM)
c. Both a and b
d. None of the above

25. **Every housewife who is planning her cooking in such a way that each part of menu is completed in specified period of time is using which of the following management technique?** (KUHS, 2022)
a. Work sampling
b. Critical path method
c. Program evaluation and review technique (PERT)
d. Decision making

26. **The term PPP in health care management stands for:** (MGIMS, 2024)
a. Public-private performance
b. Public-private principles
c. Past and present performance
d. Public-private partnership

Answers:

1.	b	2.	a	3.	a	4.	a	5.	b	6.	d	7.	d	8.	c	9.	a	10.	b
11.	b	12.	d	13.	d	14.	b	15.	c	16.	b	17.	b	18.	d	19.	b	20.	a
21.	c	22.	d	23.	a	24.	c	25.	b	26.	d								

FILL IN THE BLANKS

1. Health Survey and Development Committee is known as _____ (SAMU, 2015)
2. Bhore Committee is also known as _____ (VKSUAB, 2019)
3. The planned end point of all activities in a health program is _____ (VKSUAB, 2019)
4. _____ and _____ are two of the important component of health planning (SAMU, 2011)

Answers:

1. Bhore Committee
2. Health Survey and Development Committee
3. Objective
4. Objectives; Evaluation

TRUE/FALSE

1. PERT is associated with qualitative analysis (SAMU, 2015)
2. Critical path in network analysis is the shortest path in a network. (MU, 2024)

Answers:

1. True
2. False

CHAPTER

17

Health Care of the Community

CM17.1: Define and describe the concept of health care to community.

Q1. Discuss delivery of primary health care in rural areas/in a block level.

(WBUHS, 2011, 2016; GNSUB, 2022; SSUHSA, 2021, 2022; KIMS, 2021; 2023)

Ans: At village level: These set-ups are considered for each village or for every 1,000 population, where health care is delivered through ASHA, community health guide (CHG), trained dai (TTBA), etc.

ASHA: She is primarily a women resident of village—married/widow/divorced and preferably in the age group of 25–45 years. She should have minimum formal education up to eighth class and having effective communication skills, leadership qualities and be able to reach out to the community. ASHA performs various types of functions like creating health awareness, facilitates accessing health and health-related services, escort/accompanies seriously-ill children, providing primary medical care, etc.

CHG/VHG: He/she is a person with an aptitude for social service and is not a full time government functionary. They should be permanent resident of the local community and they should have minimum formal education up to the VI standard. They should be able to spare at least 2–3 hours every day for community health work. Broadly the duties assigned to health guides include treatment of simple ailments, mother and child health including family planning, health education, sanitation, etc.

Trained dai (TTBA): They have received training in different aspects of maternal and child health and they are provided with a delivery kit and certificate and plays an important role in healthcare delivery at village level.

Subcenters:

- **Manpower:** One female health worker and one male health worker. Male worker is being replaced by female health worker.
- **Functions:** Antenatal care, intranatal care and postnatal care, immunization services, family planning services like IUD insertion, provision of condom and OCP, management of minor ailments, services for TB and leprosy patients, health education, participation in different national program.

Primary health center: These are established for every 30,000 people in plain area and for every 20,000 people in tribal, hilly and difficult to reach areas.

Manpower: Medical officers, nurses, PHN, pharmacist, health assistant (male and female), laboratory technicians, GDA, sweeper, etc.

Services: Outpatient services, inpatient services in selected PHCs, normal delivery facility and abortion facilities in selected PHCs, cold chain maintenance, implementation of different national program, health education, etc.

At block level: It is provided through community health centers which are located every 1,20,000 people in plain area and for every 80,000 population in tribal, hilly and difficult to reach areas.

Manpower of CHC: BMOH/MO-IC, medical officers, BPHN, PHN, GNM, laboratory technicians, counselors, paramedical ophthalmic assistant (PMOA), block accountant manager (BAM), clerks, driver, GDAs, sweepers, etc.

Functions of CHC: Outpatient care and inpatient care including management of abdominal pain, diarrhea, ARI, snake bite, poisoning; essential and emergency obstetric care; essential and emergency newborn care; cold chain maintenance; laboratory facilities like testing of sputum for AFB, rapid diagnostic test for *P. falciparum*, urine for albumin, sugar, HCG, blood for hemoglobin, sugar, *Plasmodium falciparum* and *vivax*; operative facilities like incision and drainage, vasectomy, tubectomy, etc.; counseling services for adolescents; services provided by PMOA like management of minor ailments, refraction, referral services, preparation of blind list for cataracts, etc.; implementation of different national health program like RCH-II, NTEP, NLEP, NVBDCP, NPCB, school health program, etc.

Q2. How will you measure health of people of a village near a primary health center? *(BNMUB, 2008)*

Ans: Health is multidimensional. Each dimension is influenced by numerous factors; some are known and many of them are unknown. So measurement of health will be done in terms of indicators which can be utilized near a primary health center.

A primary health center (PHC) catering a population of 30,000 population and in hilly and difficult area it is 20,000 population.

From the hospital record and monthly PHC report, we can get the mortality and morbidity information. But it is the tip of iceberg.

Apart from this information, we can collect information from the meeting (usually 4th Saturday) held at subcenter level; ANM, AWW, TBA, ASHA and Panchayat members attend this meeting for convergence activity of different program.

Information is also available with private practitioner and quacks working in the PHC area.

Data will be available from subcenter serving the nearby village. As it is a single village, a cross-sectional design can be made ready to collect data on health issue to assess status of health. Demographic profile, morbidity profile and mortality profile can be evaluated by this data. Annual data on different health issue except repeated episodes of some acute problems can be utilized here.

By analyzing the following indicators we can measure health of a particular area. Primary health center data also can be utilized to supplement the assessment for the followings:

- **Mortality indicators:** Crude death rate, infant mortality rate, child mortality rate, under 5 proportionate mortality rate, maternal mortality ratio, disease specific mortality rate.
- **Morbidity indicators:** Incidence and prevalence rate, notification rate, attendance rate at outpatient departments (health center), admission, readmission and discharge rate, duration of stay in hospital. For measurement of health, certain determinants could be important for assessment of future health.
- **Socioeconomic condition:** Majority of world's people, health status is determined by primarily by their level of socioeconomic development, e.g., per capita GNP, education, nutrition, employment, housing, political system of the country.
- **Education:** A second major factors influencing health status is education especially female. The world map of illiteracy closely coincides with maps of poverty, malnutrition, high infant and child mortality. A major factor in lowest infant mortality in Kerala is its high female literacy.
- **Occupation:** Productive work promotes health vis-a-vis unemployment showing higher incidence of ill-health and death.
- **Health services:** The purpose of health services is to improve the health status of the population, e.g., immunization of children protect from 12 vaccine preventable diseases viz. BCG, poliomyelitis, hepatitis, diphtheria, pertussis, tetanus, *Rotavirus* disease, measles, rubella, pneumonia, Japanese encephalitis and influenza.

Vaccines for UIP:
(1) BCG, (2) OPV, (3) *Rotavirus* vaccine, (4) IPV, (5) TT, (6) Td, (7) Hepatitis B vaccine, (8) DPT, (9) Pentavalent vaccine, (10) PCV, (11) MR vaccine, (12) JE vaccine.

Provision of safe water prevents mortality and morbidity from water-borne diseases.

Gender: In 1993, Global Commission on women's health was established. The commission drew up an agenda for action on nutrition, reproductive health, violence and aging. Sex ratio is number of adult female per 1,000 adult male. Ratio indicates status of health of women population.

Thus, health status of a village people nearby primary health center can be assessed.

Q3. As a BMOH, you noted that in certain villages people preferred quacks rather than your services, should you be concerned and why? What will you do about it? *(WBUHS, 2009; TRIU, 2023)*

Ans: As a BMOH, I should be concerned and should identify the following possible causes.

Reasons for concern: Government healthcare services remain unutilized. A huge amount of expenditure is running without any benefit of the society. On the contrary quacks cannot provide quality services to the people and sometimes they can cause harm to the recipient of the services.

The actions should be taken as follows:

The issues which should be assessed

- Poor availability of services
- Ratio between healthcare facilities to the population
- Lack of 24 hours service facility like normal delivery in PHC and other services
- Physical/geographical inaccessibility and lack of transport facility
- **Cultural inaccessibility:** Many woman patients are reluctant to receive the services from the male doctors. Many tribal people and marginalized groups prefer traditional healers rather than qualified doctors. Traditional customs and beliefs play an important role.
- Poor quality of services by healthcare provider which raises various types of complications and it reduces the confidences of general pubic upon healthcare providers.
- Fear of side effects, particularly about injectable drugs and vaccines, operative management, etc.
- **Rude behavior of healthcare providers:** Particularly from doctors, nurses, ANM, GDAs, etc.
- Knowledge of common people about the various types of health services provided by subcenters, PHCs, CHCs
- Lack of knowledge is existing among general population.
- **Illiteracy, ignorance, improper care seeking behavior:** Many people are illiterate and their health knowledge are very poor. They do not know when they should consult doctors and other healthcare providers.
- **Essential drugs in health centers:** Patient has to buy drugs in addition to their expenditure of transport and loss of daily wages in absence of drugs in the center(s).

Control measures by BMOH to solve these problems: At first, BMOH should assess the resources to solve these problems.

Identification of resources

Manpower:

- BMOH/MO-IC
- Medical officers
- Block public health nurse (BPHN)
- Public health nurse (PHN)
- Laboratory technicians
- Health supervisors
- Health worker (Male)
- Auxiliary nurse midwifery (ANM)
- ASHA
- Anganwadi worker (AWW), etc.

Material: Laboratory kits, weight machine and other necessary equipment, necessary drugs and IEC material, etc.

Money: If adequate money is not available at hand of BMOH (official capacity), then he/she should apply with justification to the district or state health authority for allotment of fund to manage the situation.

Implementation of strategies: Assessment of the situation will dictate the BMOH to adopt different actions to overcome the situation.

Increase the availability of services like 24 hours delivery facilities in CHC and certain number of PHCs, normal delivery facilities at subcenters, provision of abortion facilities at CHCs and certain number of PHCs because many people go to quacks, which results in unsafe abortion, which is an important cause of maternal mortality.

Facilities of IUD insertion at subcenter level and provision of OCP and condom at village level can be implemented.

Regular conduction of fixed and outreach sessions of immunization can be propaganda of medical and healthcare services.

IEC: It should be implemented with the help of BPHN, health supervisors, ANM, AWW, ASHA, etc. It can be provided through interpersonal communication, group approach (FGD or others). People should be made aware about importance of quality services and adverse effect of services provided by quacks. They should be properly explained about facilities of health services available at CHCs, PHCs, subcenters and when they should consult doctors. Fear about adverse effects of vaccines, injectable drugs and operative procedures should be removed.

Behavior change communication (BCC): It should try to follow the established mode of behavior and it must be doable in the problem context. BCC should be targeted at tribal people, SC, ST, OBC and other marginalized group of population to improve their care seeking behavior.

Regular conduction of Village Health and Nutrition Day (VHND): At AWC with the help of health worker male, ANM, ASHA to expand the range of services and at very close to the residence of the beneficiaries. Services provided at VHND are nutrition and health education about different issues, immunization to the children and pregnant women, health check up and referral services, etc.

Regular training of doctors, nurses, BPHN, PHN, ANM, ASHA to improve the quality and coverage of services should be done to implement newer programs as per protocol.

Regular follow-up of beneficiaries for IUD insertion, home-based care of postnatal mother and newborn, which will increase the confidence of beneficiaries upon healthcare providers.

Timely providing the incentives in certain beneficiaries like benefits of JSY is given to BPL, SC, ST above 19 years up to two live births for institutional delivery. Age bar has been recently withdrawn. Incentives are given for vasectomy, tubectomy, IUD insertion, etc.

Collaboration with private sectors can be increased as public private partnership. Private sectors are invited to provide various types of services at free of cost.

Example: Ayushmati Scheme provides free institutional delivery to SC, ST, BPL women including essential and emergency obstetric care. Various types of laboratory investigation facilities are available in some CHC library at subsidized rate. **Regular meeting with staffs** about various implementation strategies should be conducted regularly.

Community participation by involving ASHA, ANM, SHG, NGOs, etc., should be done.

BMOH should implement above-mentioned strategies through following infrastructure and using different categories of manpower:

BPHC (BMOH, MOs, BPHN, BHN, Counselor, etc.)
↓
PHC (MO, HS, PHN, etc.)
↓
SC (ANM, HW male, etc.)
↓
Village (ASHA, CHG, AWW, SBA, etc.)

Q4. Discuss medical care and health care not synonymous. *(WBUHS, 2008)*

Ans: Healthcare implies more than medical care. Health care means multitude of services provided to individuals or communities by the agent of health services or professions for the purpose of promoting, maintaining, monitoring or restoring health. Since health is influenced by a number of factors such as adequate food, housing, sanitation, healthy lifestyles, protection against environmental hazards and communicable diseases, the frontiers of health extend beyond the narrow limits of medical care.

The term medical care refers chiefly to those personal services that are provided directly by physicians or rendered as the result of physician's instruction. It ranges from domiciliary care to resident hospital care.

Thus, health care and medical care is not synonymous.

CM17.2: Describe community diagnosis.

Q5. What is community diagnosis? *(WBUHS, 2023; RGUHS, 2003, 2009; SAMU, 2009; SMU, 2013, 2015; SDVPG, 2023; MGUB, 2023)*

Ans: Community diagnosis may be defined as the pattern of disease in a community described in terms of the important factors which influence this pattern. It is concerned with both sick and healthy people in a defined population.

Objectives: Identification of health problems and felt need of the community.

Strategies: It is based on collection and interpretation of important data like age and sex distribution of a population, vital statistics rates such as birth and death rates, etc., incidence and prevalence of the important diseases of that area and social distribution of the population.

Community diagnosis at primary health center.

It is based on collection, analysis and interpretation of following data:

- **Age and sex distribution of a population:**
  - It is collected from the census reports of the area
  - It helps to understand the structure of the community
- **Vital statistics:**
  - Vital statistics like crude birth rate, crude death rate, age specific death rate, etc., are the indicators of the health and morbidity of the community.
  - Morbidity data is preferred but mortality data is widely used because it is easily available
- **Incidence and prevalence of the diseases of that area:**
  - It identifies the risk groups for various illnesses, character of diseases prevalent, nutritional, environmental and sanitation status of the community, etc.
  - Identification of felt need of the community
  - Intervention measures are adopted from above information
- **Social distribution of the population:** It involves the study of social groups, their relationships and socioeconomic status of the community.

Q6. What is the definition of community treatment? *(TDMGRMU, 2013)*

Ans: Community treatment is the steps taken to meet the health need of the community in respect to resources available as revealed by community diagnosis. Community treatment should have following actions:

- Optimum use of available resources in terms of money, manpower and materials.
- Full participation of the community
- Coordination of the efforts of other agencies

Thus, the principle of primary health care as laid down in "Alma-Ata Declaration" is fulfilled. Examples of some of the community action:

- Improvement of safe water supply.
- Health education

- Immunization for vaccine preventable diseases.
- Control of specific diseases
- Follow the health legislation.

These actions are implemented at three levels at individual level, at family, and at community level.

UNIT 3: Describe primary health care, its components and principles.

Q7. What is primary health care? *(AKUB, 2022; MGUB, 2022, 2023; AFUH, 2022; BNMUB, 2019; VKSUAB, 2020; SAMU, 2016; PBDSUHSH, 2018; YSRUHSAP, 2020; BUMP, 2010, 2012; SSUHSA, 2013, 2015; MU, 2019; SDVPG, 2023; VBUJH, 2023; KIMS, 2023)*

Ans: Definition of primary health care: Alma-Ata conference in USSR in 1978 defined, **"Primary health care is essential health care made universally accessible to individuals and acceptable to them, through their full participation and at a cost the community and country can afford."**

Essential health care based on practical, scientifically sound and socially acceptable methods and technology to the individual and communities through their full participation and at a cost, that community and country can afford.

Principles of primary health care:

- Equitable distribution
- Community participation
- Intersectoral coordination
- Appropriate technology

Delivery of primary health care:

- **Through community health center:** Located every 1,20,000 population in normal area and 80,000 population in tribal, hilly and difficult to reach areas. It provides OPD, IPD, antennal, intranatal, postnatal care, family planning services, counseling services, immunization, etc.
- **Through primary health center:** Located every 30,000 population in normal; area/20,000 population in tribal, hilly and difficult to reach areas. It provides OPD, IPD, family planning services, immunization, etc.
- **Through subcenter:** Located every 5,000 population in normal; area/3,000 population in tribal, hilly and difficult to reach areas. It provides OPD, family planning services, immunization, drug distribution to the TB and leprosy patients, etc.
- **Through village:** Located every 1,000 population. Services are provided through ASHA, AWW, community health guide, etc.

Q8. What is the elements/components of primary health care? *(WBUHS, 2009, 2023; ABKUB, 2010, 2016; BNMUB, 2017, 2018; RGUHS, 2013, 2014; TRIU, 2015, 2016; SAMU, 2012, 2016; RUJH, 2023; TDMGRMU, 2010, 2011; BUMP, 2010, 2016; SSUHSA, 2013; SDVPG, 2023; GOAU, 2023; KIMS, 2023)*

Ans: Eight elements/components of primary health care as defined in the Alma-Ata conference in USSR (1978):

1. **Health education regarding prevailing diseases:** Education imparts knowledge and knowledge catalysis practices. Healthy practice can be motivated giving knowledge to the people through health education.
2. **Food supply and proper nutrition:** Health is not only dependent on health department people and their activities. Nutrition is essential to make a person nutritionally fit and this will lead or help to keep the health of an individual normal.
3. **Water supply and basic sanitation:** Potable water will reduce water and food-borne diseases. Sanitation is also doing for health. Safe and wholesome water along with proper sanitation will create an environment of good health.
4. **Immunization against infectious diseases:** Specific protection against certain diseases can be adopted through vaccination. Infectious diseases are essentially taken in this intervention.
5. **Maternal and child health care including family planning:** Mothers and children are major number of beneficiaries in any country. Their health should be taken care of to prevent complications, to control problems. Good socioeconomic status will be seen, if family planning is taken by the couple.

6. **Prevention and control of locally endemic diseases:** Prevention and control measures are available for endemic diseases in all countries including India. So programs protocol should be properly followed.
7. **Appropriate treatment of common diseases and injury:** Appropriate treatment will reduce morbidity (sufferings), complications and mortality.
8. **Provision of essential drugs:** This is the responsibility of a state. These drugs are cheaper, easy to make these available.

Q8a. Describe principles of primary health care. *(WBUHS, 2010, 2016, 2021, 2023; BNMUB, 2016, 2023, 2017; RGUHS, 2001, 2003, 2006, 2012; TRIU, 2013, 2014, 2015; SAMU, 2007, 2015, 2016; RUJH, 2023, 2024; TDMGRMU, 2009, 2010, 2012, 2013, 2014; SSUHSA, 2010, 2015, 2023; BUMP, 2010; KIMS, 2016, 2019, 2023; NU, 2016; ABKUB, 2019; AKUB, 2023, 2024; AFUH, 2023; GNSUB, 2023; VNSGUS, 2023)*

Q8b. Enumerate the principles of primary health care. How is it delivered in rural area? *(WBUHS, 2011, 2016, 2023; SSUHSA, 2023)*

Ans: This primary health care should follow certain principles which will help the country to do their best for most of their population. Principles of primary health care are described hereunder.

a. **Equitable distribution (equitable distribution of health services—an important principle of primary health care—justify)** *(WBUHS, 2013, 2024; ABKUB, 2007; MGUB, 2023, 2024)*
It is the first principle of primary health care. According to this principle, health services must be shared equally by all people, irrespective of their ability to pay and all (rich or poor/urban or rural people) must have access to health services. If the health services are mainly concentrated in major towns and cities, it results an inequality of care to the people in rural areas. Even among the rural areas, many people in tribal, hilly or difficult to reach area cannot reach the health center due to inaccessibility. This has been termed as social injustice. Primary healthcare aims to redress the imbalance.
Example: Subcenters are located for every 5,000 people in plain area and for every 3,000 people in tribal, hilly and difficult to reach areas. These are established for all residing in rural area both rich and poor. Every individual has an access to these service centers. CHCs are located for every 1,20,000 people in plain area and every 80,000 people in tribal, hilly and difficult to reach areas.

b. **Community participation** *(DU, 2000; BUMP, 2013; SSUHSA, 2010)*
Countries are now conscious of the fact that universal coverage of primary health care cannot be achieved without the involvement of community. The community should voluntarily come in all levels of service delivery and decision making.
ASHA, CHG, trained Dai, AWW are selected by the local community and trained locally. Their participation is utmost important for the delivery of primary health care to the community. By overcoming cultural and communication barrier, they are the people who can provide primary health care in ways that are acceptable to the community.

c. **Intersectoral coordination** *(WBUHS, 2008; BNMUB, 2013; RGUHS, 2015; ABKUB, 2004)*/**Intersectoral coordination plays key role for achieving "Health for All."** *(AKUB, 2022)*
There is an increasing realization of the fact that the components of primary health care cannot be provided by the health sector alone. The declaration of Alma-Atta states that primary health care involves various sectors other than health for efficient delivery of health care like agriculture, animal husbandry, food, industry, education, housing, public work, communication, etc. To achieve such cooperation, countries may have to review their administrative system, reallocate their resources and introduce suitable legislation to ensure that coordination can take place.
Examples: IPPI requires the involvement of different sectors like health, transport, railway, panchayet, school, college, NGO, media, police, military, etc. ICDS workers and ASHA work together in proper coordination in the working field.

d. **Appropriate technology (ORS is an example of appropriate technology)** *(WBUHS, 2018, SSUHSA, 2024)*

It has been defined as **"technology, that is scientifically sound, adaptable to local need, acceptable to those who apply it and those for whom it is used, and that can be maintained by people themselves keeping with the principle of self-reliance with the resources the community and country can afford."** **Example:** ORS is scientifically sound drug, adaptable and acceptable by local people; community and country can afford it. This appropriation in technology should be thought for primary health care.
Thus, it can be said that principles of primary health care are applied during delivery of healthcare services among rural people in India.

Q9. What are the determinants of primary health care? *(RGUHS, 2003)*

Ans: The determinants of primary health care based on four principles of it are community participation, appropriate technology, intersectoral coordination and equitable distribution. Though the mode of delivery of Primary Health Care is different from country to country and within the country from place to place and time to time, these are common and important.

The determinants of primary health care depend on:
- Type of illness prevalent
- Availability of resources (money, manpower and resources)
- Set up of objectives and fixing priorities
- Active participation of the community at large.

Q10. Primary health care basically the responsibility of the state. *(WBUHS, 2008)*

Ans: The Alma-Ata conference in USSR in 1978 defined, "Primary health care is essential health care made universally accessible to individuals and acceptable to them, through their full participation and at a cost the community and country can afford." India participated the conference and was one of the signatories.

Four principles of primary health care are:
1. Equitable distribution
2. Community participation
3. Intersectoral coordination
4. Appropriate technology

So, we can come to the conclusion that primary health care is the responsibility of the state.

CM17.4: Describe national policies related to health and health planning and millennium development goals (MDGs) and sustainable development goals (SDGs).

Q11. Describe MDG in detail. *(SMU, 2011; KIMS, 2015; NIMSUR, 2015; DU, 2005; NU, 2011, 2015)*

Ans: During September 2000, representatives from 189 countries met at the Millennium Summit in New York, to adopt the United Nations Millennium Declaration. The goals in the area of development and poverty eradication are now widely referred to as 'Millennium Development Goals".

In this summit, leaders are made specific commitments in the following areas:
- Peace, security and disarmament
- Development and poverty eradication
- Protecting our common environment, human rights, democracy and good governance
- Protecting the vulnerable
- Meeting the special needs of Africa
- Strengthening the United Nations.

It has some goals, target, and indicators. Three of the 8 goals, 8 of the 18 targets, 18 of the 48 indicators of progress are health-related and are required to achieve them.

Goals	Targets	Indicators
Goal 1: Eradicate extreme poverty and hunger	**Target 1A:** Halve, between 1990 and 2015, the proportion of people living on less than $1.25 a day	• Poverty gap ratio (incidence x depth of poverty) • Share of poorest quintile in national consumption
	Target 1B: Achieve Decent Employment for Women, Men, and Young People	• GDP growth per employed person • Employment rate • Proportion of employed population below $1.25 per day (PPP values) • Proportion of family-based workers in employed population
	Target 1C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	• Prevalence of underweight children under five years of age • Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	**Target 2A:** By 2015, all children can complete a full course of primary schooling, girls and boys	• Enrollment in primary education • Completion of primary education
Goal 3: Promote gender equality and empower women	**Target 3A:** Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015	• Ratios of girls to boys in primary, secondary and tertiary education • Share of women in wage employment in the non-agricultural sector • Proportion of seats held by women in national parliament
Goal 4: Reduce child mortality rates	**Target 4A:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	• Under-five mortality • Infant (under 1) mortality • Proportion of 1-year-old children immunized against measles
Goal 5: Improve maternal health	**Target 5A:** Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	• Maternal mortality ratio • Proportion of births attended by skilled health personnel
	Target 5B: Achieve, by 2015, universal access to reproductive health	• Contraceptive prevalence rate • Adolescent birth rate • Antenatal care coverage • Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria, and other diseases	**Target 6A:** Have halted by 2015 and begun to reverse the spread of HIV/AIDS	• HIV prevalence among population aged 15–24 years • Condom use at last high-risk sex • Proportion of population aged 15–24 years with comprehensive correct knowledge of HIV/AIDS
	Target 6B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	Proportion of population with advanced HIV infection with access to anti-retroviral drugs
	Target 6C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	• Prevalence and death rates associated with malaria • Proportion of children under 5 sleeping under insecticide-treated bed nets • Proportion of children under 5 with fever who are treated with appropriate antimalarial drugs • Incidence, prevalence and death rates associated with tuberculosis • Proportion of tuberculosis cases detected and cured under DOTS (Directly Observed Treatment Short Course)

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Goals	Targets	Indicators
Goal 7: Ensure environmental sustainability	**Target 7A:** Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources	
	Target 7B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	• Proportion of land area covered by forest • CO_2, total, per capita and per $1 GDP (PPP) • Consumption of ozone-depleting substances • Proportion of fish stocks within safe biological limits • Proportion of total water resources used • Proportion of terrestrial and marine areas protected • Proportion of species threatened
	Target 7C: Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation	• Proportion of population with sustainable access to an improved water source, urban and rural • Proportion of urban population with access to improved sanitation
	Target 7D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum-dwellers	Proportion of urban population living in slums
Goal 8: Develop a global partnership for development	**Target 8A:** Develop further an open, rule-based, predictable, non-discriminatory trading and financial system	Includes a commitment to good governance, development, and poverty reduction
	Target 8B: Address the special needs of the Least Developed Countries (LDCs)	**Includes:** Tariff and quota-free access for LDC exports; enhanced program of debt relief; and more generous ODA (Official Development Assistance) for countries committed to poverty reduction
	Target 8C: Address the special needs of landlocked developing countries and small island developing states	Through the Program of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly
	Target 8D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	• Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and small island developing states • Official development assistance (ODA): – Net ODA, total and to LDCs, as percentage of OECD/DAC donors' GNI – Proportion of total sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) – Proportion of bilateral ODA of OECD/DAC donors that is untied – ODA received in landlocked countries as proportion of their GNIs – ODA received in small island developing states as proportion of their GNIs • Market access: – Proportion of total developed country imports (by value and excluding arms) from developing countries and from LDCs, admitted free of duty

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Goals	Targets	Indicators
		– Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries – Agricultural support estimate for OECD countries as percentage of their GDP – Proportion of ODA provided to help build trade capacity • Debt sustainability: – Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) – Debt relief committed under HIPC initiative, US$ – Debt service as a percentage of exports of goods and services
	Target 8E: In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries	Proportion of population with access to affordable essential drugs on a sustainable basis
	Target 8F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	• Telephone lines and cellular subscribers per 100 population • Personal computers in use per 100 population • Internet users per 100 population

Q12. Health-related Millennium Development Goals. *(BNMUB, 2013; RGUHS, 2009; TRIU, 2014, 2024; SAMU, 2007, 2016; TDMGRMU, 2010, 2013, 2016; KIMS, 2017, 2023; NU, 2016; DU, 2007)*

Ans: Health-related Millennium Development Goals and its target and indicators

Goal No.	Target and indicators
Goal 1: Eradicate extreme poverty and hunger	**Target:** Halve, between 1990 and 2015, the proportion of people suffer from hunger **Indicators:** • Prevalence of underweight children under five years of age • Proportion of population below minimum level of dietary energy consumption
Goal 4: Reduce child mortality rates	**Target:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate. **Indicators:** • Under five mortality rate • Infant mortality rate • Proportion of 1-year-old children immunized for measles.
Goal 5: Improve maternal health	**Target:** Reduce by three quarter, between 1990 and 2015, maternal mortality ratio. **Indicators:** • Maternal mortality ratio • Proportion of births attended by skilled health personnel • Contraceptive prevalence rate • Adolescent birth rate • Antenatal care coverage (3 or more) • Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria, and other diseases	**Target:** Have halted by 2015, and began to reverse, the spread of HIV/AIDS Have halted by 2015, begun to reverse the incidence of malaria and other major diseases

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Goal No.	Target and indicators
	Indicators: • HIV prevalence among young people • Malaria death rate/1,00,000 children in 0–4 years • Malaria death rate/1,00,000 people in all ages • Malaria prevalence rate/1,00,000 population • Proportion of population under age 5 in malaria risk areas using ITN • Proportion of population under age 5 with fever being treated with antimalarial drugs. • TB death rate per 1,00,000 population • TB prevalence rate per 1,00,000 population • Proportion of smear positive pulmonary tuberculosis (PTB) cases detected and put under DOTS. • Proportion of smear positive pulmonary tuberculosis (PTB) cases detected and cured under DOTS.
Goal 7: Ensure environmental sustainability	**Target:** Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. • Halve, by 2015, the proportion of people without sustainable access to safe drinking water. • By 2020. To have achieved a significant improvement in the lives of at least 100 million slum dwellers **Indicators:** • Proportion of population using biomass fuel. • Proportion of population with sustainable access to improved water sources urban and rural. • Proportion of urban population with access to improved sanitation.
Goal 8: Develop a global partnership for development	**Target:** In cooperation with pharmaceuticals companies, provide access to affordable, essential drugs in development countries. **Indicators:** Proportion of population with access to affordable essential drugs on a sustainable basis.

What are sustainable development goals (SDG)? *(BNMUB, 2017, 2020; ABKUB, 2023)*

In September 2015, the United Nations General Assembly adopted new development agenda: Transforming our world—the 2030 agenda for sustainable development.

It is a set of 17 "Global goals" with 169 targets:

Goal Nos.	Goals
Goal 1: No Poverty	End poverty in all its forms everywhere
Goal 2: Zero Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Goal 3: Good Health and Well-being	Ensure healthy lives and promote well-being for all at all ages
Goal 4: Quality Education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5: Gender Equality	Achieve gender equality and empower all women and girls
Goal 6: Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all
Goal 7: Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8: Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9: Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
Goal 10: Reduced Inequality	Reduce income inequality within and among countries
Goal 11: Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient, and sustainable

Contd...

Contd...

Goal Nos.	Goals
Goal 12: Responsible Consumption and Production	Ensure sustainable consumption and production patterns
Goal 13: Climate Action	Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy
Goal 14: Life Below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15: Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16: Peace and Justice Strong Institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17: Partnerships to Achieve the Goal	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Health-related sustainable development goals and its targets: *(RUJH, 2023)*

Goal	Targets
3.1	By 2030, reduce the global maternal mortality ratio to less than 70 per 1,00,000 life births
3.2	• By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce • Neonatal mortality to at least as low as 12 per 1,000 live births • Under 5 mortality to a at least as low as 25 per 1,000 live births
3.3	• By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical • Diseases and combat hepatitis, water-borne diseases and other communicable • Diseases.
3.4	• By 2030, reduce by one third premature mortality from non-communicable diseases • Through prevention and treatment and promote maternal health and well-being
3.5	Strengthen the prevention and treatment of substance abuse, including narcotic drugs abuse and harmful use of alcohol.
3.6	By 2030, halve the number of global deaths and injuries from road traffic accidents
3.7	By 2030, ensure universal access to sexual and reproductive healthcare services including for family planning, information and education, and the integration of reproductive health into national strategies and programs.
3.8	Achieve universal health coverage, including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all.
3.9	• By 2030, sustainable reduce the number of deaths and illness from hazardous • Chemicals and air, water and soil pollution and contamination
3. a	Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries.
3. b	• Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing • Countries, provide access to affordable essential medicine and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in Agreement on **TRIP (Trade-related Aspects of Intellectual Property Rights)** regarding flexibilities to protect public health, and in particular, provides access to medicines for all.
3. c	Substantially increase health financing and the recruitment, development, training and retention of health workforce in developing countries, especially in least developed countries and small island developing states
3. d	Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.

Describe healthcare delivery in India.

Discuss the 3 tier system of healthcare delivery in our state? What are the reforms made to give better service to people? Discuss the role of Private Public Partnership in different delivery of health services.
(WBUHS, 2012; RGUHS, 2010, 2012, 2015; BNMUB, 2015; GNSUB, 2023)

3-tier system of healthcare delivery in the state of West Bengal is present as follows:

First tier: In this tier, healthcare services are delivered by voluntary workers (ASHA, VHG/CHG, link workers), subcenter staff (MPHW—1st ANM and 2nd ANM), Primary Health Center (Doctors, nurses, ANMs, health assistants, etc.).

Second tier: In this tier, health care is provided by Community Health Center or Rural Hospital (specialist doctors, other MOs, nurses, etc.), State General Hospital, Sub-Divisional Hospitals, District Hospitals, other state hospitals. All hospitals provide specialist care for individual patients.

Third tier: In this tier, health care is provided at Apex Institutions of the state. Medical colleges are providing specialty and super-specialty care from their end. Other Apex institutions (ID and BG Hospitals, BC Roy Hospital for Children, etc.), are also providing tertiary level of care for the people.

Reforms made to give better services: Various types of reforms have been introduced particularly after NRHM like—**Indian Public Health Standards (IPHS):** IPHS have been prepared for subcenters, PHC, CHCs, subdivision and district hospitals to provide optimal care to community and to achieve and maintain acceptable standards of quality of care. These standards indicate minimum requirements and cover services, infrastructure, staff, equipment, safe waste supply, waste disposal, investigation facilities, and drugs in two categories, essential and desirable. These standards also provide criteria for location, layout and space for buildings (infrastructure facilities).

ASHA: These man-powers are introduced at the village level, who is to be primarily a women resident of village—married/widow/divorced and preferably in the age group of 25–45 years. She should have minimum formal education up to eighth class and having effective communication skills, leadership qualities and be able to reach out to the community. ASHA performs various types of functions like creating health awareness, facilitates accessing health and health-related services.

2nd ANM in subcenter: This manpower has been introduced in subcenter for expansion of services like normal delivery facility. This is a residential post and quarters have been established adjacent to subcenters.

Normal delivery facility at subcenter: This is a newer reform for increasing the proportion of institutional delivery. So, a well equipped subcenter is a better option for normal delivery. These subcenters should have the basic amenities like electricity and water supply and ANMSs should be adequately trained.

Strengthening of PHCs: Existing PHCs are being strengthened under NRHM through better staffing as per IPHS and human resource development, clear quality standards, better community support, outreach services, regular supply of essential drugs and equipment and round the clock services. 2nd medical officer/ Ayush MO has been introduced in many PHCs.

Village Health and Nutrition Day (VHND): This has been proposed to be organized in AWC which acts as a platform for intersectoral convergence. It is expected that VHND if organized regularly and effectively can improve bring health seeking behavior of community. The ASHAs, AWW and other grass-root workers should mobilize the villagers, especially women and children, to assemble at the nearest AWC on the scheduled day. On the VHND, villagers can interact freely with the health and nutrition personnel and obtain basic services and information.

Janani Surakhya Yojona (JSY): This scheme is introduced under NRHM, which is a maternity benefit scheme, where JSY cash assistance is linked to antenatal care during pregnancy, institutional care during delivery and immediate postpartum period in a health center. The objective of the program has been introduced to reduce maternal and neonatal mortality by promoting institutional deliveries among poor pregnant women.

In high performing states like West Bengal, all SC, ST, BPL women, 19 years and above, up to two live births are getting financial benefits. Recently age limit, children limit have been withdrawn.

Janani Shishu Suraksha Karyakram (JSSK): This scheme has been introduced to reduce out of pocket expenditure of poor Indian women. Under this scheme, eligible beneficiaries are getting free diagnostic facilities, free blood and medicine, free surgical facility, free diet, free transport, etc.

Public Private Partnership (PPP): The collaboration between government and private sectors have been introduced to expand the range of services and improve the quality of services. **Examples:** Under Ayushmati Scheme, BPL women are getting free delivery facilities at designated private institutions including essential and emergency obstetric care. The private and non-profit sectors are very much accountable to overall health system and services of the country. Therefore, collaboration between public and private sector is necessary.

Examples:

- CT scan, MRI, dialysis unit in government hospital.
- Private laboratory at CHC, district hospitals.
- Matriyan scheme, Ayushmati scheme.
- Hiring services of private doctors (Anesthetists and Obstetricians) in FRU.
- Cleaning services, kitchen, biomedical waste disposal system in government hospitals.
- Community-based health insurance.

Mainstreaming of AYUSH: AYUSH interventions are initiated under NRHM as these services overcome the cultural barriers of large number of eligible beneficiaries. AYUSH medical officers are posted at PHC and CHC level. Specialty clinics, specialty therapy centers are being established in district hospitals.

Q15. What is primary health center? How does it differ from a hospital? *(TRIU, 2016; WBUHS, 2018)*

Ans: Primary Health Center is a health facility where primary health and medical care is provided for early diagnosis and treatment for common communicable and non-communicable ailments and preventive and promotive health care is offered to people who can save themselves by their own afford.

Difference between primary health center and hospital:

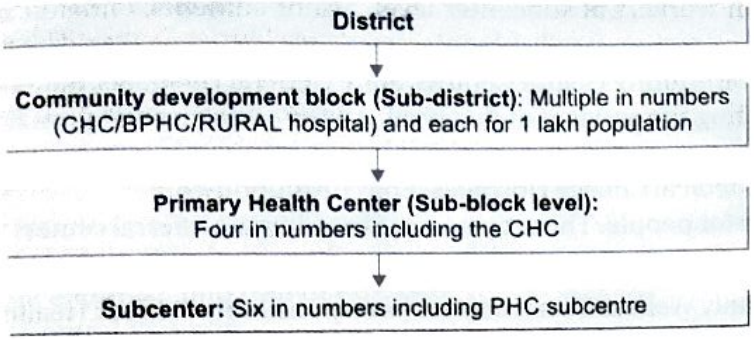
Primary health center	*Hospital*
Population covered: It is established for every 30,000 population in plain area and for every 20,000 population in tribal, hilly, difficult to reach areas.	**Population covered:** There is no such fixed population catered by hospital which is a part of comprehensive health care.
Manpower of PHC are a single or two medical officers, health supervisors (male and female), laboratory technician, pharmacists, sweeper, etc.	Services are mainly provided by medical officers along with support staff like nurses, dressers, group D staff, etc.
Services: It mainly provides OPD services as medical care and emergency services in need. PHC provides other preventive and promotive services.	It manly includes diagnosis (History and clinical examination, laboratory investigations, radiological investigations, etc.), and treatment (medical therapy, surgical treatment, etc.).
MCH services: Normal delivery facility are available in PHCs. Vaccination services, growth monitoring of children, antenatal care, etc., are services for mothers and child.	24 hours normal delivery facility is available in all hospitals. Upgraded CHCs have the facilities of cesarean section also. Vaccination services, antenatal care are also available here in hospital.

Q16. Give the organogram of healthcare delivery in India. *(TDMGRMU, 2015)*

Ans: Healthcare delivery in India has been organized in a systematic manner. Community development block has been considered as the basic block (unit) of healthcare delivery in rural India. This block has been proposed for around one lakh population. In rural area, services have been started from village level.

Services at village level, at Subcenter at Primary Health Center and CHC/BPHC/Rural hospital: Answer from previous question.

Organogram of Healthcare Delivery in India:



Q17. Discuss the various healthcare systems in India. *(TDMGRMU, 2012)*

Ans: Healthcare services are delivered in the community through various healthcare systems which constitute management sector and this involves good organization for the healthcare services. Five major sectors are involved in healthcare delivery in India. Socioeconomic condition of the people, their belief and customs, political framework, service attitude and feasibility, etc., influence in the selection of a particular system for some kind of healthcare services.

Five systems are as follows:

1. **Public health sector:**
   - *Primary health care:* Voluntary care at villages, primary health center, subcenter
   - *Health center/hospital:* Community Health Center, Rural Hospitals, State General Hospital, Sub-divisional Hospital, District Hospital, Specialty Hospital, Medical College Hospital, Apex Hospital in state, etc.
   - *Health Insurance Scheme:* Employees State Insurance, Central Government Health Scheme
   - *Other agencies:* Defense services, railway services.
2. **Private sector:** Private hospitals, clinics, nursing homes, practicing physician's dispensary, etc.
3. **Indigenous system of medicine:** Ayurveda, Yoga, Unani, Siddha, Homeopathy **(AYUSH)**
4. **Voluntary health agencies**
5. **National health program**

Students are advised to elaborate briefly all the items mentioned here.

Q18. What is comprehensive health care? Write briefly on healthcare delivery system in India. *(SAMU, 2011)*

Ans: The term **"Comprehensive health care"** was first introduced by Bhore committee in 1946. He defined comprehensive health care as provision of integrated preventive, curative, promotional services from "womb to tomb" to every individual in a defined geographic area.

Criteria for comprehensive health care:

- Provide adequate preventive, promotive, curative, and rehabilitative health services
- Be as close to the beneficiaries as possible
- Has the wider cooperation between the people, service and profession
- Is available to all irrespective of their ability to pay
- Look after especially the vulnerable and weaker sections of the community
- Create and maintain a healthy environment both homes as well as working places.

Q19. What are various levels of health care in India? Discuss the functions of PHC relating various activities of District Health Society. *(ABKUB, 2006; WBUHS, 2022)*

Ans: Three levels of health care are present in India.

1. **Primary level:** In this level, primary care is provided by voluntary healthcare providers at village level, multipurpose health workers at subcenter level. Minor ailments, endemic diseases, maternal and child health problems, vaccination, family planning methods, etc., are taken care of in this level.
2. **Secondary level:** Community Health Centers, State General Hospitals, Sub-Divisional Hospitals, District Hospitals are providing the services at this level. All the cares given at primary level are given here along with special medical care.
3. **Tertiary level:** The Medical College Hospitals, Apex Institutions, other Super-Specialty Hospital provide special medical care for people. These centers are the ultimate referral centers for patients from secondary or primary level.

District Health and Family Welfare Samiti confers its responsibility to Block Health and Family Welfare Samiti. The activities are worked out here under guidance of District Samiti. These are given here under.

Public health activities:

- National Vector-borne Disease Control Program; Malaria, Filaria, Japanese encephalitis, Dengue, Chikungunya and Kala-azar
- Integrated Disease Surveillance Program (IDSP)
- Acute Flaccid Paralysis (AFP) and Measles Surveillance
- National Leprosy Eradication Program
- National Tuberculosis Elimination Program
- Iodine Deficiency Disorders Control Program (IDD)
- Any other program-based reports are dealt by PHC under public health activities.

Reproductive and Child Health Programme (RCHP):

- Health Management Information System (HMIS)
- Routine Immunization (RI)
- Outreach Vaccination Session (Planned and Held)
- Village Health, Sanitation and Nutrition Committee Meeting (VHSNC)
- Village Health and Nutrition Day (VHND)
- Family planning activities (IUD, tubectomy, vasectomy)
- Stock of vaccines (Open Vial Policy)
- Pharmacy stocks
- Any other program-based reports are dealt by PHC under RCH activities

Q20. What is a "Community Health Center"? Describe how health care is delivered to a population covered by a community development block. *(RGUHS, 2008; KUHS, 2010)*

Ans: Community Health Center (CHC) is an upgraded primary health center (in some of the states this is called Block Level Primary Health Center) for each Community Development Block covering a population of 80,000–1,20,000 distributed on an average in 100 villages.

Few CHCs are acting as FRUs in each district and also referral for PHCs/BPHCs in the catchment area.

Details of CHCs are discussed in Q22c.

Q21. What are the functions of Block Primary Health Center? Mention the National Programs under a BPHC. What is "Record Linkage" and what is "tracking of beneficiaries" under maternal and child health care? *(WBUHS, 2014)*

Ans: Discussed in Q22c.

National programs under a BPHC: Most of the health programs are implemented in rural India and the basic control unit is BPHC. The common programs under BPHC are listed below.

1. National Vector Borne Disease Control Programme (malaria, filaria, kala-azar, dengue, chikungunya, Japanese encephalitis)

2. National Tuberculosis Elimination Program
3. National Leprosy Control Program
4. National Diarrheal Disease Control Program
5. National AIDS Control Program
6. National Program for Control of Blindness
7. National Iodine Deficiency Disorders Control Program
8. National Vitamin A Prophylaxis Program
9. National Nutritional Anaemia Control Program
10. National Integrated Child Development Services Scheme
11. National Reproductive and Child Health Program
12. National Cancer Control Program
13. National Mental Health Program
14. School Health Program
15. National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke

Record linkage: An extensive and complex process, record linkage is both a science and an art.

Record linkage is the term used by statisticians, epidemiologists, and historians, among others, to describe the process of joining records from one data source with another that describe the same entity.

Record linkage is necessary when joining data sets based on entities that may/may not share a common identifier (national identification number), as may be the case due to differences in record shape, storage location, and/or curator style or preference.

Tracking of healthcare beneficiaries: Tracking of eligible couples, pregnant woman and children is advocated to keep vigil of these groups of beneficiaries in mother and child health program (RCH program).

Tracking of eligible couples and use of contraceptives: This section (called Section-I) has an Index and 3 formats (EC-1, EC-2 and EC-2A). The line-list of each eligible couple with their names, contact details and MCTS/RCH ID number of the woman, etc., are being recorded in the Index. EC-1 format has columns for recording details of each eligible couple EC-2A format is for recording the same information as given in EC-2 format for the subsequent year.

Tracking of pregnant women: This section (Section-II) has an index and 5 formats (PW-1, PW-2, PW-3, PW-4 and PW-4A).

PW-1 format has columns for recording PW's date of registration, LMP, EDD, past history of general illness, complication during last pregnancies, etc., including the laboratory reports of VDRL and HIV screening test for the current pregnancy. **PW-2** format is for recording details of services provided to pregnant woman during antenatal care (ANC) visits.

PW-3 format is for recording the brief of delivery outcome including the date, time, weight and vaccination given to the newborn at birth. After delivery of the child, seven PNC visits are to be made.

PW-4 format is for recording details of services provided to mother and newborn during four postnatal care (PNC) visits.

PW-4A format is for recording details of services provided to mother and newborn during remaining three PNC visits.

Tracking of children: This section (Section-III) has index and three formats (CH-1, CH-2 and CH-3).

Q22. **Discuss Indian Public Health Standard (IPHS).** *(SAMU, 2015; SSUHSA, 2016; NIMSUR, 2015; NU, 2012; RUJH, 2014)*

Ans: Indian Public Health Standard (IPHS) has been developed to provide basic promotive, preventive and curative primary healthcare services to the community as subcenter, primary health center and block primary health center/community health center level.

Objectives:

- To achieve and maintain an acceptable standard of quality of care
- To monitor as well as improve the quality of function of different levels of health centers with standard developed.
- Indian Public Health Standard (IPHS) for subcenter

Q22a. Structure and manpower of subcenter:

Ans: Subcenters: These are established for every 5,000 people in plain areas and for every 3,000 people in tribal, hilly and difficult to reach areas. So, it is very close to the resident of beneficiaries.

As per IPHS 2012, subcenters have been categorized as type A and Type B depending upon their catchment area, health seeking behavior, caseload and location of other facilities.

Type A subcenters are provided all recommended services except facilities for conducting delivery. Type B subcenters are provided all recommended services including facilities for conducting delivery.

Staff at subcenter (3,000–5,000) population

Type of subcenter	*Subcenter A*		*Subcenter B*	
Staff	Essential	Desirable	Essential	Desirable
ANM/health worker (F)	1	1	2	
Health worker (M)	1		1	
Staff nurse or ANM if staff nurse is not available				1
Safai Karmachari	1 (Part-time)		1 (Full-time)	

Various types of services are available at subcenter level:

1. **Maternal health care:**
   - Antenatal clinics are functioning at subcenters where registration, 4 antenatal check-ups, various clinical examination and laboratory investigations are done. Iron and folic acid supplementation.
   - *Immunization services:* Outreach sessions are conducted in subcenters once in a week, where vaccines are transported from CHC/PHC and children and pregnant women receive vaccines at subcenters.
   - Now the normal delivery facilities are available in selected subcenters, referral in case of complications.
   - *Child health care:* Essential newborn care, promotion of exclusive breastfeeding, immunization and vitamin A prophylaxis and prevention and control of childhood diseases like malnutrition, ARI and diarrhea.
   - Family planning services are given from SC like IUD insertion, provision of condom and OCP and referral for safe abortion (MTP).
   - Adolescent health care—education, counseling, referral
   - Assistance to school health services
   - Water quality monitoring and sanitation
   - Field visit for disease surveillance, family welfare services including STI and RTI awareness and referral
   - Community need assessment (CNA)
   - Management of minor ailments like diarrhea with some or no dehydration, ARI, pain abdomen, fever, worm infestation and referral.
   - Training of TBAs, ASHA and other health volunteers
   - National health programs

   Active participation in the following national program and control of any outbreak of diseases in the subcenter area.
2. **National Tuberculosis Elimination Program:** Provision of DOTS and documentation
3. **National Vector Borne Disease Control Program:** It covers 6 vector borne diseases.

4. **National Leprosy Eradication Program:** Referral of leprosy cases to BPHC, provision of MDT, follow up and defaulter, retrieval
5. **National Polio Eradication Programme:** Active participation
6. **National AIDS Control Programme—awareness on STI/RTI referral for PPTCT:** HIV-TB coordination, distribution of condom
7. **National Programme for Control of Blindness:** IEC and referral, Record of vital events

Indian Public Health Standard (IPHS) for primary health center.

(RUJH, 2013, 2014; MUHS, 2019; SSUHSA, 2024)

Structure and manpower: Primary health center are established for every 30,000 people in plain area and for every 20,000 people in tribal, hilly and difficult to reach areas. It is based on 40 patients per doctor per day with available indoor/observation beds (6 beds).

Staff at primary health center (20,000–30,000)

Staff	Existing	Recommended
Medical officer	1	1–2
AYUSH practitioner	Nil	1
Account-cum data entry operator	Nil	1
Pharmacist	1	1–2
Nurse midwife (staff nurse)	1	3–5
Health worker (F)	1	1
Health assistant (M and F)	1	1
Health educator	1 (Some PHCs)	1
Cold chain and vaccine logistic assistant	Nil	1
Laboratory technician	1	1
Class IV (GDA, sweeper)	4	3
Sanitary worker-cum watchman	Nil	1–2

(GDA: general duty attendant: PHC: primary health care)

Various types of services are available at primary health center level:

A. **Medical care:**
- *Outpatient services:* Patients of fever, diarrhea, lower abdominal pain, ARI, hook worm infestation, etc., are managed at OPD, which runs from around 9 AM to till patients turn (around 4 PM) at every Monday to Saturday.
- *Inpatient services in selected PHCs:* 6 beds are available in selected PHCs, particularly where 2 medical officers are posted. Patients of diarrhea, OP poisoning, snake bite, malaria, ARI, etc., cases can be managed here.

B. **Maternal and child health care:**
- *Antenatal care:*
  - Early registration
  - Laboratory investigation
  - Iron and folic acid supplementation
  - Referral
- *Intranatal care:*
  - 24 hours normal delivery in upgraded PHCs
  - Assisted delivery including forceps
  - Manual removal of placenta
  - Referral

C. **Postnatal care:**
- Minimum 2 postnatal visits by subcenter staff
- Initiation of breastfeeding within half an hour
- Education on nutrition, hygiene and contraception
- Provision of facilities under Janani Suraksha Yojana (JSY)

D. **Newborn care:**
- Essential newborn care
- Resuscitation
- Management of hypothermia and jaundice.

E. **Care of child:**
- Emergency care of sick newborn under IMNCI guidelines
- Promotion of breastfeeding up to 6 months
- Immunization and vitamin A prophylaxis with 9 doses.

F. **Family planning:** Full range of family planning services, counseling and referral for MTP services
G. **SRI/RTI:** Awareness and management of RTI/STI
H. **Nutrition services:** Prevention and management of malnutrition, anemia and vitamin A deficiency
I. **School health:** Assistance in promotion of school health services.
J. **Adolescent health:** Education, counseling, referral
K. **Disease surveillance:** Regular reporting and control of epidemics
L. **Vital events:** Collection and reporting of vital events
M. **Promotion of water quality and sanitation**
N. **Training:**
- Health workers and TBA
- ASHA, ANM
- IMNCI training

O. **Basic laboratory services:**
- Routine blood, stool, urine
- Blood smear for malaria
- Pregnancy test
- Sputum for AFB
- Gram staining
- RPR test for syphilis

P. **Monitoring and supervision:**
- Subcenter activities, ASHA
- Monitoring national health program

Q. **Mainstreaming of AYUSH:**
R. **National health programs**

Normal delivery facility and abortion facilities by manual vacuum aspiration/mifepristone with misoprostol in selected PHCs are available in PHC.

Cold chain maintenance: For this purpose, deep freezers and ice lined refrigerators are available wherein packs are prepared and different vaccines are stored.
Health education for different groups of people is arranged at community level by PHC staff. Training of different categories of staff is organized of public health importance.
Environmental modification by construction of sanitary latrine and chlorination of drinking water etc. are implemented by other coordinating sectors where health sector monitors.

Q22c. Block primary health center/community health center (BPHCs/CHCs):

Ans: Structure and manpower: It is situated in a community development block, covering a population of 80,000–1,20,000 distributed on an average of 100 villages.

Facilities available: 30 beds for inpatients.

- Specialists' services like medicine, surgery, obstetrics and gynecology and pediatrics.
- X-ray facilities
- Laboratory facility
- Blood bank

Block/community health center catering population of (80,000–1,20,000)

Doctors	*Existing*	*Recommended*
Block health officer/medical superintendent	1	
General surgeon	1	
Physician	1	1
Obstetrician and gynecologist	1	
Pediatrician	1	1
Anesthetist	–	–
Eye surgeon	–	1 for every 5 CHCs
Dental surgeon	–	
General duty medical officer	1	2
General duty medical officer of AYUSH	–	1

Support manpower	*Existing*	*Recommended*
Staff nurse	7	10
Public health nurse	–	1–2
Pharmacist/Compounder	1	2
Lab technician	1	2
Radiographer	1	1
Ophthalmic assistant	1	1
Dental assistant	–	1
Cold chain and vaccine logistic assistant	–	1
Dresser	1	
Ward boys	2	5
Registration clerk	–	2
Account assistant	–	1
Admin assistant	1	
Data entry operator	1	2
OT technician	1	
Counselor	–	–
Driver	–	1–3
Dietician	–	–

Functions (healthcare delivery) in BPHC/CHCs:

- Care of routine and emergency cases in medicine
- **Care of routine and emergency cases in surgery:**
  - This includes incision and drainage and surgery for hernia, hydrocele, appendicitis, hemorrhoids, etc.
  - Handling of emergencies like intestinal obstruction, hemorrhage, etc.
- 24 hours delivery including assisted delivery in FRUs
- Essential and emergency obstetric care including surgical interventions like cesarean sections in FRUs.

- Full range of family planning services including male and female sterilization.
- Safe abortion services (MTP)
- Routine and emergency care of sick children as well as newborn care
- Other management including nasal packing, tracheostomy, foreign body removal, etc.
- Delivery of services related to national health programs
  - *NTEP:* Diagnostic service through microscopy center and supply of drugs
  - *HIV AIDS control program:* Services under this program are also provided
  - *National Vector Borne Disease Control Programme:* Routine diagnostic and treatment facilities of malaria, filarial, dengue, Japanese encephalitis, chikungunya and kala-azar.
  - *National Leprosy Eradication Program:* Diagnosis and treatment of cases of leprosy, advice to the patient for prevention of deformity, referral if needed.
  - *National Programme for Control of Blindness:* The eye care services like diagnosis and treatment of common diseases, refraction services IOL implantation in selected CHC.
- **Other services: Mandatory in FRUs**
  - Blood storage facility
  - Essential laboratory services
  - Referral or transport services

Q23. How will you compare the health situation in two communities? *(RGUHS, 2008)*

Ans: According to WHO, health status of a community can be measured and compared by comparing various health indicators.

However, there is no single indicator which can be used to compare the health status amongst the two communities because health is multidimensional and each dimension is influenced by numerous factors. Some of them are known and many are unknown. It must be conceived in terms of a profile, employing many indicators, which may be classified as follows:

(1) Mortality indicators, (2) Morbidity indicators, (3) Disability rates, (4) Nutritional status indicators, (5) Healthcare delivery indicator, (6) Utilization rates, (7) Indicator of social and mental health, (8) Environmental indicator, (9) Socioeconomic indicators, (10) Health policy indicators, and (11) Indicator of quality of life.

Rationale: To compare the health status of two communities, various health indicators are available but there is no single comprehensive indicator of a community health. An ideal index which combines the effect of the number of components measured independently is yet to be developed.

Important health indicators proposed to measure the health status of a community selected health and **socioeconomic indicators are taken to compare with others:**

Indicator	*Low income countries*	*High income countries*
Life expectancy at birth (2011)	60	80
IMR (2011)	63	5
Under 5 mortality (2011)	95	6
Maternal mortality per 1,00,000 live birth (2010)	410	14
Doctor population ratio per 10,000 (2005–2012)	5.1	27.1
GNI per capita US $ (2011)	1313	38690
Adult literacy rate (2005–2011) %	63	97
Access to safe water (%)	67	99
Access to adequate sanitation 2011 (%)	37	100

(Source: World Health Statistics 2013)

Ayusman Bharat Health and Wellness Centre *(VBUJH, 2023; RUJH, 2024, MU, 2023)*

Comprehensive primary healthcare (CPHC) through Ayusman Bharat Health and Wellness Centre (HWCs)—were launch in 2018. Ayusman Bharat (AB) covers prevention, promotion and ambulatory health care at primary, secondary and tertiary level by adopting a **life cycle or continuum of care** approach through different phases of life.

It has two components. The first component of AB pertains to transforming/upgradation of all existing 150,000 Sub-Health Centres and all PHCs into HWCs. All SHC-HWCs have branding as per GOI guidelines and national ID number and renovated buildings. Nearly 1.1 lakh Sub-Health Centres have been transformed to AB- Health and Wellness Centres by March 2022 and remaining SHC are being updated in phased manner.

Population norms for Health and Wellness Centres:

a. HWC-SHC (Rural): One SHC is established for every 5,000 population in plain and 3,000 population in hilly/tribal/desert areas.
b. UHWC (Urban): One Urban-HWC per 15,000-20,000 population caters predominantly to poor and vulnerable population, residing in slums or other such pockets.

Health and wellness (HWC) is a key component of the Ayushman Bharat-PMJAY which is a flagship program of GOI. HWCs are envisaged to provide comprehensive primary health care (CPHC) comprising of 12 packages of service. HWC having the principle of **"time to care"** with no more than 30 minutes travel from the community. Similarly, primary health centres in rural and urban areas are being transformed to HWCs in phased manner.

Inputs for Health and Wellness Centres:

A. At upgraded SHC: At sub-centre level, HWC team will consist of ASHAs, ANMs led by mid-level service provider.
   A key addition to the primary health careteam at SHC-HWC would be a Mid-Level Health Provider (MLHP) who would be a community health officer (CHO)—a BSc in community health or a nurse GNM with BSc or an Ayurveda practitioner trained in community health through IGNOU/other state public health universities for a set of competencies in delivering public health and primary healthcare services.
B. At PHC level (Rural and Urban):
   HWC team will consist of staff as per IPHS norms led by existing medical officer in-charge. Other inputs for upgradation are asses to diagnostic (Investigations), essential medicines, sufficient space, tablets/smart phones/computer support, capacity building, referral support, community mobilizations and intersectoral convergence for providing wide range of services.

The twelve packages under CPHC at HWC-PHCs are:

1. Care in pregnancy and childbirth
2. Neonatal and infant health care
3. Childhood and adolescent healthcare services
4. Family planning, contraceptives services and other reproductive services
5. Management of communicable diseases and national health program
6. General OPD acute cases and minor ailments
7. Screening, prevention, control and management of noncommunicable diseases
8. Care for common ophthalmic and ENT problems
9. Basic oral health care management
10. Elderly and palliative health care services
11. Emergency medical services including initial management of burns and injuries
12. Screening and basic management of mental health problems

SHORT NOTES AND RELEVANT QUESTIONS

Q24. Subcenter. *(WBUHS, 2009, 2018, 2022; BNMUB, 2002; RGUHS, 2007; SAMU, 2012; SSUHSA, 2017, 2022, 2023)*/**Subcente is considered as a pivot of health care delivery system in rural area** *(WBUHS, 2009, 2018, 2023; TRIU, 2024; ABKUB, 2023)*

Ans: Subcenters: These are established for every 5,000 people in plain areas and for every 3,000 people in tribal, hilly and difficult to reach areas. So, it is very close to the resident of beneficiaries.
Write details from Q.22a.

Q25. Functions of primary health center (PHC). *(WBUHS, 2008, 2019, 2021; AKUB, 2022; ABKUB, 2022; YSRUHSAP, 2022; TRIU, 2013; SSUHSA, 2015, 2017, 2018, 2022; SAMU, 2016; NU, 2010, 2011; MGUB, 2023, 2024; VNSGUS, 2023)*

Ans: PHCs are established for every 30,000 people in plain area and for every 20,000 people in tribal, hilly and difficult to reach areas.
Write details from Q.22b.

Q26. Community health center (CHC). *(BNMUB, 2002; RGUHS, 2004, 2012, 2014; GOAU, 2021)*

Ans: Community health centers are established for every 1,20,000 people in plain area and for every 80,000 population in tribal, hilly and difficult to reach areas.
Write details from Q.22c.

Q27. Describe the functions of medical officer of a block primary health center. *(WBUHS, 2018, 2019, 2020; VNSGUS, 2023)*

Ans: The following functions has to perform in a block primary health center:
- Care of routine and emergency cases in surgery
- Care of routine and emergency cases in medicine
- 24 hours delivery services in rotation
- Emergency obstetric care
- Family planning and safe abortion services
- Essential newborn care and referrals
- Routine and emergency care of sick newborn
- Essential laboratory services
- Referral services with transport support in mother and child care
- Implementation of national health programs as and when required

Q28. First referral unit (FRU). *(WBUHS, 2008; GNSUB, 2022; BNMUB, 2012; ABKUB, 2019; KIMS, 2021, 2022; BUMP, 2013; DU, 2016; NU, 2013; AKUB, 2023)*

Ans: It is a district or sub-divisional hospital or community health center which has the facilities for obstetric surgery, blood transfusion, anesthesia, specialist pediatric care, operation theater and required equipment, on a 24 × 7 basis. This center also has the facilities for MTP, tubectomy, vasectomy and pediatric care for high-risk neonates and other severe problems of early childhood. It provides specialist services in addition to all the services available at a PHC/CHC.

Specialist services available at FRU are:
- **Medical management of:**
  - Severe hypertensive disorder of pregnancy and eclampsia

- Hemorrhagic shock
- Severe anemia
- Septicemia
- Use of intravenous oxytocin during labor

- **Surgical management of:**
  - Normal delivery and cesarean section
  - Laparotomy and repair of rupture uterus
  - Surgical treatment of severe sepsis
  - Evacuation of incomplete abortion
  - Mid-trimester abortion
  - Amniotomy with/without oxytocin
  - Tubectomy/vasectomy including full range of family planning services/laparoscopic services
- **Manual management of:**
  - Manual removal of placenta
  - Forceps delivery
  - Vacuum extraction are the few important issues
  - Partograph
- **Anesthesia:** General and spinal
- **Blood transfusion:**
  - Bleeding a donor and blood transfusion
  - Essential laboratory services
- **Newborn and pediatric care:**
  - Resuscitation
  - Management of sick and low birth weight newborns and severe illnesses of young children
- **Other support activities:**
  - Referral transport
  - Safe abortion services
  - Treatment of STI/RTIs

Q29. FRU will reduce MMR—explain. *(WBUHS, 2009, 2018)*

Ans: Maternal mortality is an important burden in our country. Various types of medical and social causes are responsible for high maternal mortality in our country. Important medical causes of maternal mortality are hemorrhage, sepsis, hypertensive disorder of pregnancy, unsafe abortion, obstructed labor, anemia in pregnancy, etc.

FRU is a district or sub-divisional hospital or community health center which has the facilities for obstetric surgery, blood transfusion, anesthesia, specialist pediatric care, operation theater and required equipment. It provides specialist services in addition to all the services available at a CHC.

Services available for reduction of MMR at FRU are:

- Medical management
- Surgical
- Obstetric services
- **Anesthesia:** General, spinal
- Blood transfusion

Details from previous Q.28

Thus, FRU can reduce MMR.

Q30. Difference between comprehensive health care and curative health care. *(BNMUB, 2019)*

Ans:

Comprehensive health care	*Curative health care*
It is the adequate mix up of preventive, curative, promotive and rehabilitative health services.	Curative health care is a part of comprehensive health care.
It is mainly provided through subcenters, PHCs, CHCs	It is mainly provided through hospitals.
It includes health education, immunization, counseling, nutritional interventions, environmental modification along with diagnosis and treatment.	It manly includes diagnosis (by clinically, laboratory investigations, radiological investigations, etc.), and treatment (medical therapy, surgical treatment, etc.)

Q31. Difference between PHC and CHC. *(BNMUB, 2008; MU, 2019)*

Ans:

PHC	*CHC*
It is established for every 30,000 population in plain area and for every 20,000 population in tribal, hilly, difficult to reach areas.	It is established for every 1,20,000 population in plain area and for every 80,000 population in tribal, hilly, difficult to reach areas.
Manpower of PHC are medical officers, PHN, health supervisor (male and female), laboratory technician, pharmacists, sweeper, etc.	Manpower of CHC are BMOH/MO-IC, medical officers, BPHN, PHN, GNM, laboratory technician, counselors, PMOA, block account manager, sweeper, etc.
It mainly provides OPD services or some PHC have 5 beds.	Every CHCs have minimum 10 beds.
Normal delivery facility are available in some PHCs.	24 hours normal delivery facility is available in all CHCs. Upgraded CHCs have the facilities of cesarean section also.

Q32. ASHA/eligibility criteria for selection of ASHA. *(WBUHS, 2019; BNMUB, 2020, ABKUB, 2017, 2019; VKSUAB, 2018; RGUHS, 2013; GITAMAP, 2033; TDMGRMU, 2014, 2015; SSUHSA, 2010, 2022; KIMS, 2021, 2023; SMU, 2009; DU, 2015; NU, 2010; MU, 2019; MUHS, 2019; GOAU, 2021; GNSUB, 2023; AKUB; 2023; VNSGUS, 2023; TRIU, 2023, DBRAUA, 2024)*/**ASHA' links healthcare delivery with community.** *(WBUHS, 2010)*/**ASHA play a crucial role in primary healthcare system.** *(WBUHS, 2021)*

Ans: Accredited Social Health Activist (ASHA) plays an important role in linkage of healthcare delivery with community. She has to be a permanent resident of the village, may be married/widow/divorcee and is preferably in the age group of 25–45 years. She should have minimum formal education up to class eight. She should have effective communication skill, leadership quality and be able to reach out to the community.

Roles and responsibilities of ASHA:

- She creates awareness on health and its social determinants and counsel women on issues of reproductive and child health.
- She mobilizes the community (mother, children, etc.), and facilitates accessing health and other related services at AWW/subcenter/primary health center such as immunization, ANC, supplementary nutrition and other services provided by the government.
- She helps in organizing Village Health and Nutrition Day (VHND) at AWC once/twice a month. She helps AWW in the field activities such as enumeration of eligible couples and mobilizing beneficiaries.
- She provides primary medical care for minor ailments. For this she is provided a drug kit that will include AYUSH and allopathic formulations.
- She arranges escort/accompany seriously-ill children/cases of maternal complications to the nearest preidentified designated health facility.
- She can also be a provider of Directly Observed Treatment Short Course (DOTS) for tuberculosis.
- She acts as a depot holder for ORS, IFA tablets, Chloroquine, Disposable Delivery Kits (DDK), oral pills and condom.

- She informs about birth and death in her village and any unusual health events/disease outbreaks in the community to the subcenter/primary health center.
- She works with village health and sanitation committee to develop a comprehensive village health plan.

ASHA is selected from the community and she delivers her services from government sector. So she is in-between government and community. **Thus, it can be said that 'ASHA' links healthcare delivery with community.**

Q33. Role of ASHA as depot holder. *(WBUHS, 2016; SAMU, 2022)*

Ans: She stored the following items like oral rehydration salt (ORS) packets, iron folic acid (IFA), chloroquine, disposable delivery kit (DDK), oral pills and condoms, etc. **Hence ASHA act as depot holder.**

Q34. What are the average populations catered in relation to health—in a village, subcenter, PHC, BPHC or CHC? Who serves at the level of subcenter? What are the activities carried out at subcenter, PHC, BPHC/CHC? *(WBUHS, 2016; KIMS, 2016; SSUHSA, 2018)*

Ans: In a village population catered in relation to health is:

- ANM is catering a population of 5,000
- ASHA is catering a population of 1,000
- AWW is catering a population of 1,000

Remaining part is already answered in previous questions.

Q35. Write the role of Anganwadi worker, health worker (female) and ASHA. Where do they coordinate within themselves with examples. Role of ASHA in maternal and neonatal care. *(GNSUB, 2022; RUJH, 2012, 2019)*

Ans: A subcenter has been considered here having a population of 5,000. At first, we have to find out approximate number of infants in the 5,000 population.

Crude birth rate in India (2015) is 20.00/1,000 population (Sample Registration System, Government of India, 2014). Some pregnancies do not result in a live birth, i.e., abortion and still birth may occur. The expected number of live birth would be an under estimation of the total number of pregnancies. So correction factor (Pregnancy wastage) of 10% is added to the expected number of live birth.

Expected number of live birth/year in the subcenter = 20 × 5,000/1,000 = 100; Pregnancy wastage = 10% of 100 =10; Expected total pregnant women in one year = 100 + 10 = 110; Expected number of infants in the subcenter the number of live-births minus number of death of infant. Considering IMR 40 per 1,000, approximately 4 infants will die from 100 infants. So the infants who will move for the second year of life will be 96 (100 – 4).

A subcenter is composed of 5 villages containing 5,000 population. Approximately each village having 20 number of infants and children. Subcenter arranges immunization session on Wednesday at the office once in a month. Most of the children are taken by their mothers to the center for immunization. Remaining children are taken care of at their doorstep. Other Wednesdays of the month will be utilized for these infants and children with help of 2nd ANM. Outreach sessions are held in the village in ICDS center (AWC) or club house of the locality (community participation). There are 5 ASHAs in 5 villages; they are maintaining their own register of child along with uncovered child and pregnant mother. These sessions are done every or alternate month depending upon the number of unvaccinated children, demand of the local people and leaders, participation of the voluntary workers (AWW, link workers, etc.).

A good planning with micro-plan for manpower, logistic support, vehicular support, vaccine transport, site selection, publicity in the area is essential.

Record keeping is mandatory to follow the next activity in the locality. Children number, vaccination date, advice to mothers, area covered, AEFI, etc., are recorded and utilized later on for future activity.

Again in **4th Saturday meeting**, convergence of activity regarding immunization of infants and pregnant mothers is held at panchayat level in the presence of panchayat member, ANM, ASHA, AWW and trained TBA, etc., and subsequent up-gradation of Eligible Couple and Child Register **(ECCR)** is discussed and done.

Q36. Preventive services offered by your medical colleges and hospitals. *(WBUHS, 2014; GNSUB, 2022; SSUHSA, 2024)*

Ans: A series of preventive services offered by our medical colleges and hospitals like immunization against 12 vaccine preventable diseases (VPDs) are regularly done. Each and every medical college runs immunization clinic everyday for preventing VPDs.

Pentavalent vaccine is used against diphtheria, pertussis, tetanus, hepatitis B and *Haemophilus influenzae* type B (Hib). (Smallpox eradication—intensified campaign was started in 1967 worldwide for eradication of smallpox. In 1980, global eradication of smallpox was confirmed. In this regards, medical colleges took a major role in advocacy and research. Again vaccines were stocked in two places of world in Russia and USA for immediate measures if further resurgence of smallpox occurs in world. Medical college is providing major role to implement those activities.) Japanese encephalitis vaccines are given to children up to 15 years of age to prevent Japanese encephalitis.

Vitamin A prophylaxis—9 doses of vitamin A in oil is given up to 5 years of age children. First dose of 1 lakh IU is given along with measles vaccination.

Free IFA tablets to pregnant mothers, lactating mothers, IUD users, adolescent girls, all categories of children are given to prevent and control nutritional anemia.

Advocacy to use iodized salt for prevention of iodine deficiency disorders is done by medical teachers. Pre-exposure prophylaxis for HIV, condom promotion for prevention of child birth and STI, syphilis screening for detection of syphilis and subsequent treatment for prevention of STI, X-ray to detect tuberculosis, lung cancer screening are few of the services to diagnose a case for prompt treatment to prevent complications.

Q37. Accessibility cannot be equated with acceptability of health services—Justify. *(WBUHS, 2014; TRIU, 2024)*

Ans: Primary healthcare services provided by healthcare providers should be universally accessible to the community. Again accessibility of the services depends upon the site of service point. If this site be reachable by general people, then the services are accessible to the people.

Take the example of immunization activity. All eligible children and pregnant mothers may not attend the subcenter on a fixed day to receive vaccines. For these uncovered beneficiaries, authority has to arrange outreach session of vaccination to cover these people vaccinating at their door-step in the village easily reachable by them. Even though, few beneficiaries are not covered at all. This vaccination site of outreach session is accessible to the people. This is the concept of accessibility. On the contrary, vaccination services are taken by the children of poor families of the distant villages at the outreach session site but due to distance the vaccination services are not taken by the same poor families. This is the question of poor accessibility.

Other example is PAP smear examination. This is a good service to detect cervical cancer at very early stage to control the situation in the individuals. The PAP smear examination services are accessible to the people of remote rural area but due to cultural barrier of our society these services were not acceptable to them—the people of rural area. Now it is clear from the above discussion that acceptability and accessibility are not synonymous and one cannot be equated with other one.

Q38. Three tier structure in Panchayat Raj. *(WBUHS, 2020; YSRUHSAP, 2023; TDMGRMU, 2014; SMU, 2012)*

Ans: The Panchayat Raj is a 3-tier structure of local self government in India which links village to district. These three levels are (1) the village level—Panchayat, (2) At the block level—Panchayat samiti, (3) At the district level—Zilla Parishad. **At village level:** Gram Sabha—all adult members of village meet at least twice in a year. They elect the member of gram panchayat. They also fix up annual program and decide tax of the area. Gram panchayat—it is executive body of gram sabha. It caters the population of 5,000–15,000 or more. The members of panchayat hold office for a period of 3–4 years. Every panchayat has an elected Pradhan or Mukhiyas or Sarpanch, an Upa-Pradhan and Secretary.

At block level: The Panchayati Raj Institute at the block level is Panchayat samiti. The panchayat samiti consists of members of the block elected for this samiti. Apart from that, MLAs, MPs of the area, women

representatives, scheduled castes, scheduled tribes and cooperatives societies are parts of this samiti. The Block Development Officer (BDO) is the ex-officio secretary of panchayat samiti. Development works are divided to different Karmadhakshya for smooth functions of activities in the block. They coordinate different agencies in the block like administration, health and social welfare.

At district level: The Zilla Parishad is the agency of rural local self-government in the district level. The members of Zilla Parishad include all the elected personalities, heads of panchayat samiti within the districts. Apart from that, MLAs, MPs of the area, women representatives, scheduled castes, schedule tribes and 2 person experienced in administration are part of Zilla Parishad. The collector of district is a nonvoting member. The members of Zilla Parishad varies from 40–70. Every Zilla Parishad is headed by Sabhadhipati and other karmadhyaksha help him/her to coordinate different activities in the district. Collector or District Magistrate is the ex-officio secretary of Zilla Parishad.

Q39. List uses of hospital records. *(RGUHS, 2007; TDMGRMU, 2010)*

Ans: It is compilation of records of one individual which originating in different times or places. This is used to describe the process of bringing the records together relating to one individual or a family.

Data used: Birth, marriage, hospital admission, discharge, other investigation reports, death are used in record linkage.

Uses: Twin study, measurement of morbidity, chronic disease epidemiology, family and genetic study.

Advantage: Useful for studying association between diseases.

Disadvantages: (a) Huge volume of data, (b) Beyond the reach of developing countries.

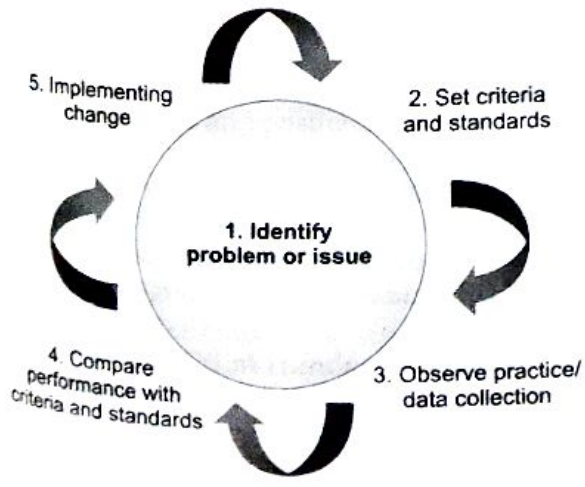
Q40. Medical audit. *(TDMGRMU, 2012)*

Ans: Clinical audit is a process that has been defined as "a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change."

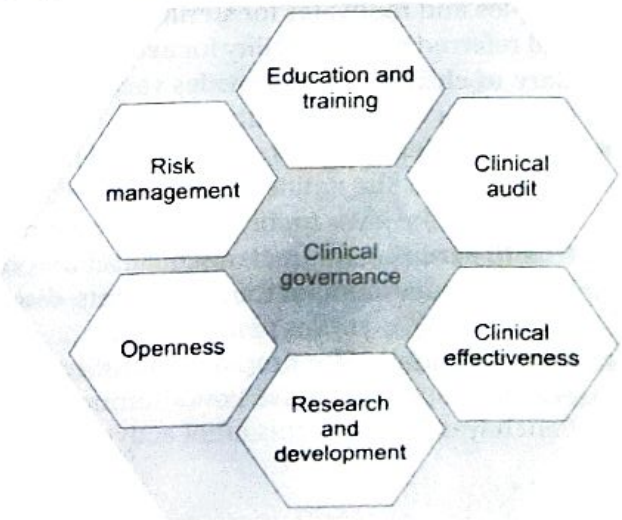
While clinical audit makes great sense, there can be problems in persuading hospitals and clinicians to undertake and apply clinical audit in their work.

Florence Nightingale, Ernest Codman (1869–1940): Whilst Codman's 'clinical' approach is in contrast with Nightingale's more 'epidemiological' audits, these two methods serve to highlight the different methodologies that can be used in the process of improvement to patient outcome.

Clinical audit—the process:



The place of clinical audit in modern healthcare:



Types of audit:

- Standards-based audit
- Adverse occurrence screening and critical incident monitoring
- Surgical audit
- Peer review
- Patient surveys and focus groups

Q41. Job description (functions) of multipurpose health worker/health worker female/ANM.

(ABKUB, 2013; BNMUB, 2017; PBDSUHSH, 2018; KIMS, 2021; RGUHS, 2012, 2014, 2015; SMU, 2010; NU, 2011)

Ans: Female multipurpose health worker is an auxiliary nurse and midwife. She covers the population of 5,000 in plain areas and in hilly of tribal areas 3,000. She is posted at subcenter. She is the front line staff in rural areas to deliver different services in the rural areas.

Job description:

- **Record keeping: She maintains the following registers:**
  - Clinic attendance register
  - Antenatal register
  - Post natal register
  - Eligible couple register
  - Under 5 children register
  - Home visiting register
  - Birth and death register
  - Family planning register
- **Antenatal care:** She provides antenatal care at clinic and also at home, cares at clinic. She distributes iron and folic acid tablets pregnant and lactating mothers. She provides tetanus toxoid to pregnant mothers. She visits the expectant mothers and provides advice on nutrition, exercise, rest, personal hygiene, breastfeeding and sensitizes on family planning.
- **Intranatal care:** If facilities available, she should conduct normal deliveries. She recognizes the danger signals in high-risk cases and referred to higher facility.
- **Postnatal care:** She visits to newly delivered mother at home. She gives advice on early ambulation, nutrition, breastfeeding, personal hygiene also motivates for family planning.
- **Family planning services:** She distributes conventional contraceptives and oral pills to the newly married couples. She identifies eligible couples and motivates the woman for IUD insertion. She identifies target couples and motivates for sterilization. She identifies cases required medical termination of pregnancy and referred nearest facility for availing the service.
- **Care of children:** She provides vaccination for vaccine preventable diseases for the children. She also distributes vitamin A solution.
- **Birth and deaths:** She keeps record of births and deaths in her area and report to higher authority.
- **Notification:** She notifies about outbreaks or notifiable diseases to higher authority.
- **Training:** She gives training to TBA about observation of 5 Cs during deliveries.
- **Health care:** She conducts antenatal clinic once in a week. She does routine examination of urine and Hb. She gives treatment for minor ailments, distribution of ORS and first aids in emergency cases. She gives drugs to TB patients as per DOTS.
- **Miscellaneous:** She prepares monthly subcenter reports and submits to PHC in monthly meeting. She participates in Pulse Polio Immunization. She coordinates her activities with Anganwadi workers, Panchayat. She performs other activities in relation to National Health Program.

Q42. What do you mean by "deprofessionalization of medicine. *(RGUHS, 2014; MUHS, 2019)*

Ans: In practice of primary health care, deprofessionalization of medicine means involvement of laymen in delivery of health care.

Medical man tried to provide health care through a new cadre of health workers like multipurpose workers, Anganwadi workers, community health workers, practitioners of indigenous medicine and social workers, etc., and tried to provide health care to the community with relatively little training and support. They also considered as a part of health teams. The medical professional have to move forward to other new roles like being a educator, case finder, preventer, counselor and also agent for social change and also engaged in diagnosis of primary ailments, prescriber of pills.

So in primary healthcare deprofessionalization should be introduced.

Q43. Indigenous systems of medicine in India/AYUSH in healthcare services for the community. *(RGUHS, 2008, 2009; TRIU, 2023)*

Ans: Indigenous system of medicine constitutes:

A—Ayurveda
Y—Yoga and naturopathy
U—Unani
S—Siddha
H—Homeopathy.

All together it is termed as AYUSH.

There is a separate wing in New Delhi under the Union Health and Family Welfare department.

Advantage: Most of AYUSH practitioners are local residents mainly found in rural areas. They mix up with the people socially and culturally.

Q44. Central Government Health Scheme (CGHS). *(WBUHS, 2013; RGUHS, 2012)*

Ans: The Central Government Health Scheme for the Central Government employees was first introduced in Delhi in 1954 to provide comprehensive medical care to Central Government employees. The scheme is based on the principles of cooperative effort by the employee and the employer, to the mutual adjustment of the both. The facilities under the scheme include the followings:

- Outpatient care through a network of dispensaries
- Laboratory and X-ray investigation
- Hospitalization facilities at government as well as private hospitals recognized for the purpose.
- Supply of necessary drugs
- Domiciliary visits
- Specialist consultation
- Pediatric services including immunization
- Antenatal, natal and postnatal services
- Emergency treatment
- Supply of optical and dental aid at reasonable rate
- Family welfare services

The scope of the scheme gradually extended over the years to cover cities outside the Delhi like Mumbai, Allahabad, Meerut, Kanpur, Kolkata, Patna, etc., and involve other sectors like-employees of the autonomous organization, Retired Central Government servants, widows receiving family pension, members of the Parliament and Ex-Governors, etc. The scheme which started with 16 allopathic dispensaries in 1954 covering 2.3 lakh beneficiaries has now 320 hospitals/dispensaries in various system of medicine and provides service to 42.76 lakh beneficiaries.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **The Alma Ata declaration on health for all was made in which year?** (MCUB, 2023; 2024)
   a. 1948 b. 1958 c. 1968 d. 1978

2. **The most essential strategy for achieving health for all is:** (ABKUB 2018)
   a. Appropriate health-related laws b. Adequate tertiary care hospitals
   c. Primary health center d. Safe water supply

3. **For providing quality health services, community participation plays an essential role. To ensure maximum community participation, which level of healthcare system should be strengthened?** (ABKUB 2020)
   a. Primary health care b. Secondary health care
   c. Tertiary health care d. First level referral facility

4. **Principles of primary health care includes all, *except*:** (DBRAUA 2024)
   a. Equitable distribution b. Appropriateness and continuity
   c. Intersectoral co-ordination d. Community participation

5. **All of the following are pillars of primary health care, *except*:** (ABKUB, 2023; GOAU 2023)
   a. Health education b. Intersectoral coordination
   c. Appropriate technology d. Equitable distribution

6. **Primary healthcare concept aims at:** (GOAU 2023)
   a. Providing advanced medical technology b. Universal accessibility of health services
   c. Effective medical care and referral facilities d. Health insurance schemes

7. **Elements of primary health care include all of the following, *except*:** (WBUHS 2023)
   a. Adequate supply of safe water and basic sanitation
   b. Preventive and control of local endemic diseases
   c. Providing employment to every youth
   d. Immunization against major infectious diseases

8. **Elements of primary health care include all of the following, *except*:** (VNSGUS 2023)
   a. Adequate supply of safe water and basic sanitation
   b. Providing essential drugs
   c. Sound referral system
   d. Health education

9. **Statement true about PHC, *except*:** (VNSGUS 2023)
   a. There is one PHC per, 30,000 population in plain areas
   b. Type A, PHC conducts <20 deliveries per month
   c. Provides MCH care/family planning and MTP
   d. It is the first referral unit

10. **Our rural masses are facing multiple health problems. The best approach to deal with their problem is to provide:** (AIUB 2023)
    a. Basic health services b. Free medical care c. Health education d. Primary health care (THOU 2023)

11. **Good examples of appropriate technology include all of the following, *except*:**
    a. ORS b. CT scan c. PPBS d. Condom (DBRAUA 2024)

12. **National Health Mission (NHM) was approved in which year:**
    a. 2005 b. 2007 c. 2023 d. 2020

3. **Three-tier system of health care includes:** *(KIMS, 2014)*
   a. Primary, secondary and tertiary level health care
   b. Primary, secondary level health care
   c. Primary and tertiary level health care
   d. None of the above

4. **The graded system of providing healthcare to the community has how many tiers?** *(DBRAUA, 2024)*
   a. One
   b. Two
   c. Three
   d. Four

5. **Full form of ASHA is:** *(RUJH, 2023; DBRAUA, 2024)*
   a. Accredited Social Health Activity
   b. Accredited Social Health Activist
   c. Accredited Simple Health Activist
   d. Active Social Hospital Activist

6. **Criteria for selecting ASHA is:** *(TRIU, 2023)*
   a. Either married or unmarried woman
   b. Only married woman
   c. Only unmarried woman
   d. Married is not a criterion

7. **The population covered by accredited social health activist is/population:** *(YSRUHSAP, 2023; KIMS, 2024)*
   a. 1,000
   b. 2,000
   c. 3,000
   d. 4,000

8. **Dress code color for ASHA:** *(AKUB, 2024)*
   a. Pink
   b. Violet
   c. Yellow
   d. Rust

9. **ASHA worker's duty include which of the following:** *(AFUH, 2023)*
   a. Give immunization to all eligible children in the village
   b. Escort all pregnant mothers to hospitals or health facility for delivery
   c. Screen village population for noncommunicable diseases
   d. Ensure optimum coverage of all governmental program under supervision of ANM

10. **ASHA is not a depot holder of:** *(RUJH, 2024)*
    a. ORS
    b. IFA
    c. Contraceptives
    d. DOTS

11. **Under National Rural Health Mission, the lowest level at which health action plan is prepared is?** *(ABKUB, 2018)*
    a. A social health agent
    b. A specific health agent
    c. Accredited social health activist
    d. Advanced scientific health activist

12. **All are correct statements about ASHA, *except*:** *(ABKUB, 2018; AFUH, 2022)*
    a. Female trained village guide
    b. One per village
    c. One per 1,000 population
    d. Female untrained guide

13. **Anganwadi workers are under the:** *(ABKUB, 2021)*
    a. Ministry of Home Affairs
    b. Ministry of Labor
    c. ICDS scheme
    d. PHC

14. **Population usually covered by Anganwadi worker:** *(AFUH, 2022)*
    a. 500
    b. 1,000
    c. 1,500
    d. 2,000

15. **A subcenter is manned by:** *(ABKUB, 2016; AFUH, 2022, 2023)*
    a. Medical officer
    b. Multipurpose worker
    c. Health assistant
    d. Anganwadi worker

16. **A subcenter is a plain/rural area which caters to a population of:** *(ABKUB, 2008; 2015, TRIU, 2023; SSUHSA, 2023; AKUB, 2023)*
    a. 1,000
    b. 2,000
    c. 3,000
    d. 5,000

17. **Population norm for one Sub-Health Centre in Tribal/Hilly areas is:** *(MU, 2024; GOA, 2023)*
    a. 3,000
    b. 5,000
    c. 20,000
    d. 30,000

28. Primary health center covers—a population as per NHM: *(AKUB, 2022)*
a. 80,000–120,000 b. 20,000–30,000 c. 3,000–5,000 d. 30,000–40,000

29. As per IPHS, a PHC is supposed to cater to a population of: *(THH, 2023)*
a. 30,000 in hilly area b. 20,000 in plain area c. 20,000 in hilly area d. None of the above

30. One primary center in plain areas cater to a population of: *(KIMS, 2024)*
a. 10,000 b. 20,000 c. 30,000 d. None of the above

31. The population covered by a primary health center in hilly and tribal areas is: *(YSRUHSAP, 2023; THH,2023)*
a. 10,000 b. 20,000 c. 30,000 d. 40,000

32. Which of the following is first referral unit in India: *(DBRAUA, 2024)*
a. Sub-center b. Primary health center
c. Community health center d. District hospital

33. Panchayati Raj Institutions includes all, *except*: *(DBRAUA, 2024)*
a. Zila Parishad b. District hospital c. Panchayat d. Panchayat Samity

34. An example of secondary healthcare level would be: *(ABKUB, 2018)*
a. Primary health center b. Subcenter
c. Community health center d. Apex health institutions

35. District hospital fall under which level of health care? *(ABKUB, 2021)*
a. Primary b. Secondary c. Tertiary d. All of the above

36. Health check-up in village school is the responsibility of: *(RUHI, 2023)*
a. Sub-center b. PHC c. CHC d. All of the above

37. Which one of the following is not included in the secondary level of healthcare system? *(RUHI, 2023)*
a. Community health center b. Sub-district hospital
c. First referral unit d. Medical college

38. Millennium Development Goals (MGDs) consists of _____ goals.
a. 5 b. 8 c. 10 d. 15

39. Goal 5 in Millennium Development Goals stands to: *(SAMU, 2016)*
a. Eradicate extreme poverty and hunger b. Reduce child mortality
c. Improve maternal health d. Ensure environmental sustainability

40. SDGs related to health: *(WBUHS, 2024; KIMS, 2023, 2024; RUHI, 2023)*
a. One comprehensive Goal-SDG3 b. One comprehensive Goal-SDG7
c. One comprehensive Goal-SDG9 d. One comprehensive Goal-SDG12

41. True regarding SDGs are all, *except*: *(AKUB, 2023)*
a. Health is positioned centrally at Goal 3 with 13 Targets
b. Targets on women empowerment are included in Goal 3
c. New areas like mortality from NCDS, substance abuse, RTAs are included in Goal 3
d. Globally, success of SDGs depends upon achievement of goals in India

42. Full form of PMSSY? *(RUHI, 2023)*
a. Pradhan Mantri Swasthya Suraksha Yojana
b. Pradhan Mantri Swasthya Seva Yojana
c. Pradhan Mantri Seva Suraksha Yojana
d. Pradhan Mantri Surakshit Seva Yojana

d	2.	c	3.	a	4.	b	5.	a	6.	b	7.	c	8.	c	9.	d	10.	d
b	12.	a	13.	a	14.	c	15.	b	16.	b	17.	a	18.	b	19.	b	20.	d
c	22.	d	23.	c	24.	b	25.	b	26.	d	27.	a	28.	b	29.	c	30.	c
b	32.	c	33.	b	34.	c	35.	b	36.	c	37.	d	38.	b	39.	c	40.	a
b	42.	a																

FILL IN THE BLANKS

One subcenter in hilly and tribal areas covers about _____ population. *(SAMU, 2015)*

There should be one doctor per _____ population in India. *(VKSUAB, 2013)*

_____ are the first level of health workers in our healthcare system. *(SAMU, 2011)*

One ASHA is for _____ population in plain areas. *(VKSUAB, 2014)*

Minimum number of beds recommended for CHC by IPHS is _____. *(VKSUAB, 2014)*

The process of diagnosing the health, health-related problems and their determinants in a community is called _____. *(VKSUAB, 2018)*

wers:

3,000

1,000

Multi-purpose health workers

1,000

30

Community diagnosis

CHAPTER

18 International Health and its Regulations

CM18.1: Define and describe the concept of International health and its regulations.

Q1. Define and describe the concept of International health and its regulations.

Ans: Concept of international health: In order to fight against several diseases such as cholera, yellow fever, plague and smallpox, series of international conferences and meetings were initiated from 1851 to 1938. Afterwards, various organizations have been established like Pan American Sanitary Bureau (1902), Office of the International d' Hygiene Publique (1907), the Health Organization of the League of Nations, etc. United Nations have absorbed all the other health organization to form the " WHO" after completion of world War II. Different agencies like multilateral agencies, bilateral agencies, nongovernmental organizations (NGOs), donor foundations was established to offer international assistance in different forms.

All the international agencies are functioning with core objective of improving overall health and development of the nations. Apart from funding, they also provide technical expertise and evolve new strategies as per needs. Most agencies work towards achievement of sustainable development goals and universal health coverage. They mainly focus on prevention and control of public health problems like communicable diseases (tuberculosis, malaria, HIV/AIDS, etc.), emerging and re-emerging diseases and noncommunicable diseases.

Q1a. Enlist the international health agencies functioning in india, write the works of multilateral and bilateral agencies. *(RUJH, 2014; BNMUB, 2020)*

Ans: Multilateral agencies: Multilateral organizations are formed between three or more nations to work on issues that relate to all the countries in the organization.

Institutions/agencies pool resources from multiple donors (government/nongovernment) and offer technical and commodity assistance globally or countrywide through cash grants or loans.

WHO, UNICEF, UNDP, UNFPA, UNAIDS, UNHCR, UNFDAC, World Bank, FAO, ILO.

Bilateral agencies are the agencies working under the bilateral agreement of India and some other foreign countries. The activities in India of some of the bilateral agencies are given below:

- **Colombo plan**: Activities industrial and agricultural sectors with a view to improve standard of living in those countries.
- **United States Agency for International Development (USAID):** Activities—malaria eradication, medical education, nursing education, health education, water supply, sanitation, control of communicable disease and family planning.
- **Swedish International Development Agency (SIDA):** Tuberculosis control program.
- **Danish International Development Agency (DANIDA):** National Leprosy Eradication Program, National Tuberculosis Elimination Program and National Program for Control of Blindness.
- **Ford Foundation:** Rural Health Training Centre, Singur, West Bengal, India, Research-cum-Action (RCA) project type of latrine, Calcutta water supply and drainage scheme.
- **Rockefeller Foundation:** Helped in establishment of All India Institute of Hygiene and Public Health (AIIH and PH), All India Institute of Medical Science, New Delhi; King George Medical College, Lucknow; Christian Medical College, Vellore; National Institute of Virology, Pune.

- **Cooperative for Assistance Relief Everywhere (CARE):** Mid-day meal, ICDS, Educational and Vocational Training.
- **Red Cross:** Providing medical assistance of war victim, disaster relief services, maintaining blood bank. Red Cross home at Bengaluru for ex-servicemen.
- **Freedom from hunger:** Sustainable self-help solutions to fight against chronic hunger and poverty.
- **Aga Khan Foundation:** Health systems, education, rural development, income generation.
- **Save the Children Fund:** Health care, education and welfare.
- **Oxfam:** Development activities and advocacy are the main work carried by Oxfam also fight against poverty and injustice in the world including India.

Describe in brief Voluntary Health Agency, Networking with voluntary health agency play an important role in health care delivery—Explain.

(WBUHS, 2010, 2011; MGUB, 2022; RGUHS, 2012, 2014)

International organizations have many roles to play in control of pandemic—justify.

(WBUHS, 2022; GOAU, 2021)

Voluntary Health Agency occupies an important place in community health program. It may be defined as an organization that is administered by an autonomous board, collects fund for his support chiefly from private sources and expends money, whether with or without paid workers, in conducting a program directed primarily to improve and progress public health by providing health services or health education or by advancing research or legislation for health.

Functions/Activities of Voluntary Health Agencies *(MUHS, 2019)*

- **Supplementing the work of Government agencies:** Government agencies cannot provide complete service because they operate under financial and statutory restrictions. The voluntary health agencies can supplement the work of Government agencies by lending personnel or contributing funds to provide services.
- **Pioneering:** The voluntary agencies are in a position to explore ways and means of doing new things. The family planning programme in India is an example of pioneering.
- **Education:** There is unlimited scope for health education in India. The Government agencies cannot cope with the problem, unless it is supplemented by voluntary effort on the part of people.
- **Demonstration:** By putting up demonstrations and experimental projects, the voluntary health agencies have advanced the cause of public health. The demonstration of bore-hole latrine by Rockefeller foundation to solve the problem of hookworm in India is a good example.
- **Guarding the work of government agencies:** By setting a good example, voluntary agencies can always guide and criticise the work of Government agencies.
- **Advancing health legislation:** The voluntary agencies can also mobilize public opinion and advance legislation on health matters for the benefit of whole community. Thus, network of voluntary health agency play an important role in healthcare delivery in above mentioned ways.
- In the view above activities the international organization works in collaboration of state authorities.

Describe Nongovernment Organization and its role in Community Health.

(WBUHS, 2014; RUJH, 2018; AKUB, 2024; KIMS, 2024)

Nongovernment organization (NGOs) may be defined as the organizations that are **nonprofit making, nonpolitical, nonviolent** with organized group of people who are seeking to influence policy but not holding Government office. They are registered under society Act of India and remain independent of state influence. Sometimes interchangeably terms are used like grassroot organization, voluntary sector, civil society, independent sector and nonstate sectors, etc. NGOs are varied remarkably in resources, size, scope of activity and goals. They are ranged from huge funded organizations and supported by many local groups around the world.

Some of the reputed International Nongovernmental Organizations are Oxfam, Save the children, CARE, Rotary International, ActionAid, HelpAge, etc.

International Health Regulations:

- **Since 1969**, WHO has required that all cases of the following diseases be reported to the organization—cholera, plague, yellow fever, smallpox, relapsing fever and typhus.
- **Under the IHR (2005)**, all cases of these four diseases must be automatically notified to WHO—smallpox, poliomyelitis due to wild-type poliovirus, SARS and cases of human influenza caused by a new subtype.
- **Internationally notifiable diseases** (i.e., cholera, plague, and yellow fever) are also reportable in compliance with the World Health Organization's International Health Regulations. The following list includes water-related and waterborne diseases that are nationally notifiable.
- **Public health emergencies of international concern (PHEIC): Six events** were declared between 2007 and 2020: the 2009 H1N1 influenza pandemic, Ebola (West African outbreak 2013–2015, outbreak in Democratic Republic of Congo 2018–2020), poliomyelitis (2014 to present), Zika (2016) and COVID-19 (2020 to present). Poliomyelitis is the longest PHEIC. Zika was the first PHEIC for an arboviral disease.

CM18.2: Describe roles of various international health agencies.

Q3. Describe WHO. *(WBUHS, 2008, 2022; MGUB, 2022, 2024; BNMUB, 2010, 2020; ABKUB, 2015, 2018; YSRUHSAP, 2021, 2023; SSUHSA, 2006, 2015; RUJH, 2021, 2023; KIMS, 2021, 2023; SAMU, 2016, 2022; TDMGRMU, 2010, 2012; BUMP, 2012; SDVPG, 2023; VNSGUS, 2023)/* **Role of WHO in global health** *(SSUHSA, 2024)*

Ans: The draft constitution of World Health Organization (WHO) was **finalized in New York in 1946**, but formal ratification of **WHO constituted** by the member countries was done **on 7th April, 1948**. This day is celebrated as World Health Day (WHD) annually and declared a theme.

Slogan for 2021 is **"Building a fairer, healthier world for everyone".**

Slogan for 2022 is **"Our planet our health. Clean our air, water and food."**

Slogan for 2023 is **"Health for all".**

Slogan for 2024 is "My health, my right"

Headquarters of six regions is in **Geneva, Switzerland**.

Region	*Headquarters*
Southeast Asia	New Delhi (India)
Africa	Brazzaville Congo
The Americans	Washington DC (USA)
Europe	Copenhagen (Denmark)
Eastern Mediterranean	Alexandria (Egypt)
Western Pacific	Manila (Philippines)

The Southeast Asia Regional Office comprises **11 members**, Bangladesh, Bhutan, India, Indonesia, North Korea, Maldives islands, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste. **Headquarters of Southeast Asian region is New Delhi.**

Following services are provided under WHO:

- **Prevention and control of diseases:** The WHO collects and disseminates epidemiological information on diseases subjected to International Health Regulation and occasionally other communicable diseases of international importance and also work on noncommunicable disease problems such as cancer, cardiovascular disease, genetic disease, mental disorder, drug abuse and dental disease. The fields of vector biology and control, immunology, quality control of

drugs, drug evaluation and monitoring and health laboratory technology are relevant to the control of communicable and noncommunicable diseases.

- **Development of health system:** WHO promotes and supports national health policy development and development of comprehensive national health program.
- **Family health:** It includes maternal and child health care, human reproduction, nutrition and health education, etc.
- **Environmental development:** WHO advises Governments on national program, the provision of basic sanitary services, directions to protect the quality of water, air and food, radiation protection and early identification of new hazards originating from new technological development.
- **Health statistics:** WHO has continued to publish weekly epidemiological record and World Health Statistics annual reports.
- **Biomedical research:** WHO supports the research work by technical and financial assistance.
- **Health literature and information:** WHO publishes a monthly journal known as the Bulletin of World Health Organization. It also publishes the technical report series on various issues. The WHO library is one of the satellite centres of Medical Literature Analysis and Retrieval System **(MEDLARS)** of the US National Library of Medicine.
- **Cooperation with other organization:** WHO collaborates with specialized agencies and maintains various degrees of working relationships.

Describe UNICEF. *(WBUHS, 2009, 2016, 2021; AKUB, 2022; BNMUB, 2017; ABKUB, 2008, 2022, 2024; YSRUHSAP, 2020; RGUHS, 2013; TRIU, 2016, 2023; TDMGRMU, 2013; SAMU, 2010, 2011; KIMS, 2015, 2017, 2021, 2024; SMU, 2014; SSUHSA, 2018; MU, 2019; GOAU, 2022; VNSGUS, 2023; SDVPG, 2023)*

Describe GOBI-FFF *(MGUB, 2022, 2024; TDMGRMU, 2012; SAMU, 2015)*

UNICEF plays an important role in child health. *(WBUHS, 2019)*

United Nations International Children's Emergency Fund, **established in 1946** to deal with rehabilitation of children in war ravaged countries. When the emergency functions were over in **1953** renamed as **United Nations Children's Fund** but abbreviation remained same as **"UNICEF". Headquarters** is **in New York** with **seven regional offices.**

Regional offices of UNICEF:

Regional office	*Headquarters*
The Americas and Caribbean Regional Office	Panama City, Panama
Europe and Central Asia Regional Office	Geneva, Switzerland
East Asia and the Pacific Regional Office	Bangkok, Thailand
Eastern and Southern Africa Regional Office	Nairobi, Kenya
Middle East and North Africa Regional Office	Amman, Jordan
South Asia Regional Office	Kathmandu, Nepal
West and Central Africa Regional Office	Senegal

South Asia Regional office consists of following 8 countries—Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. UNICEF works in close collaboration with WHO, UNDP, UNESCO and FAO. UNICEF also gives assistance to countries which covers field of maternal and child health, nutrition, environmental sanitation, health education and program which directly or indirectly benefit children's health.

UNICEF is promoting a campaign known as **GOBI for a "child revolution."**

G—growth charts to better monitor child development
O—oral rehydration for no dehydration and some dehydration cases
B—breastfeeding
I—immunization against measles, diphtheria, polio, pertussis, tetanus, tuberculosis and hepatitis

The Campaign has now been extended to **GOBI-FFF** campaign, where FFF stands for:
F = Female literacy (female empowerment)
F = Food fortification
F = Family planning and spacing

Q5. Describe CARE. *(WBUHS, 2010; ABKUB, 2005)*

Ans: **Cooperative for Assistance and Relief Everywhere (CARE)** was **founded in** North America in the wake of 2nd world war in the year **1945**. (Cooperative for American and Relief Everywhere).
It is one of the world's largest independent, nonprofit making international relief and development organization. CARE provides emergency aid and long-term development assistance. CARE has project in 72 countries around the world. **International Secretariat is in Geneva, Switzerland. CARE** began its operation in India in 1950. Till the end of 1980s, the primary objective of **CARE-India** was to provide help for the children in the age group of 6–11 years. CARE-India works in partnership with Government of India, State Government, NGOs, etc. Currently worked in Andhra Pradesh, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and West Bengal.

It is helping in the following projects in India:
- Integrated nutrition and health projects (INHP)
- Better health and nutrition project
- Anemia control programme
- Improving women's health project
- Improved health care for adolescent girl's project
- Child survival project
- Women's reproductive health and family spacing project

Q6. Describe World Bank. *(BNMUB, 2008)*

Ans: It is a specialized agency of United Nations. **Headquarters** is **in Washington.** It was established with the purpose of helping less developed countries to raise their living standards. The power of the bank is vested in a Board of Governors. The bank gives loans for projects that will lead to economic growth like India's Population project.

- **The projects are usually concerned with:**
  - Electric power
  - Roads
  - Railways
  - Agriculture
  - Water supply
  - Education
  - Family planning
- Health and environmental components have been added to many projects. Co-operative program exist between WHO and the World Bank.
  - Projects for water supply
  - World food programme
  - Population control
  - Control of Onchocerciasis program in West Africa

Q7. Describe Indian Red Cross. *(WBUHS, 2008, 2019; RGUHS, 2014; TDMGRMU, 2011; ABKUB, 2005)*

Ans: The Indian Red Cross society was established in 1920. It has a network of 400 branches all over India. It worked for promotion of health, prevention of disease and mitigation of suffering among the people. **Headquarters is in New Delhi.**

Its activities are given below:

- **Relief work:** When disaster strikes any part of the country, the Red Cross Society immediately mobilizes all the resources and goes to the rescue of the affected people.
- **Milk and medical supplies**: A number of hospitals, dispensaries, maternity and child welfare centres, schools and orphanages receive assistance from the society every year. The assistances are given consistently mainly of milk powder, medicine, vitamin and other supplies.
- **Armed force:** The care of the sick and wounded among the members of the forces is one of the primary obligations of the Red Cross.
- **Maternal and child welfare services:** There are large numbers of maternity and child welfare centers all over India, either directly administered by or are affiliated to the Red Cross. There is a bureau of Maternity and Child welfare, which provides technical advice and financial aid to scheme for establishing model maternity and child welfare centers.
- **Family planning:** Several states in India are running family planning clinics under the auspices of Indian Red Cross.
- Maintaining Blood Banks and promoting blood donation for the persons affected in wars or disasters and also provide first aid support for war victims. It maintains **Red Cross Home** at **Bengaluru** for permanently disabled ex- servicemen, which is one of the pioneer Institute in Asia. It provides nursing and rehabilitative care of the disabled and paralytic ex-servicemen.

Q7a. Explain Activities of International Red Cross.

(RGUHS, 2002, 2008, 2013; ABKUB, 2007; GOAU, 2022; MGUB, 2023)

Ans: It was founded by **John Henry Dunant**, a Switch businessman in about 1859 during the battle of Solferino, North Italy. He succeeded in holding an international conference,1864, at **Geneva, Switzerland (Headquarters)** and treaty was signed for relief of the wounded and sick soldiers. This resulted in the constitution of International Committee of Red Cross (ICRC), the founder organization of Red Cross, having branches all over the world.

The activities are as follows:

- Service to armed forces
- Services to war veterans
- Disaster services
- First aid and nursing
- Health education
- Maternity and child welfare services

Q8. Describe Rockefeller Foundation.

(GITAMAP, 2023; RGUHS 2009; RUJH, 2012)

Ans: The **Rockefeller Foundation** is a private foundation based at 420 Fifth Avenue, **New York City (Headquarters)**. It was established by the six-generation Rockefeller family. The Foundation was started by Standard Oil owner John D Rockefeller (Senior), along with his son John D Rockefeller (Junior), and Senior's principal oil and gas business and philanthropic advisor,

Frederick Taylor Gates, in New York State on May 14, 1913, when its charter was formally accepted by the New York State Legislature. It is stated as a philanthropic organization and its mission is "promoting the well-being of humanity throughout the world".

It confined to medical education and public health and later it expanded its fields to social sciences, humanities and agricultural sciences. It started functioning in India from 1920, with a scheme for the control of hookworm disease in the then Madras presidency.

Activities in India:

- It helped in the establishment of All India Institute of Hygiene and Public Health, Kolkata; All India Institute of Medical Sciences, New Delhi; King George's Medical College, Lucknow, Christian Medical College,

Vellore, Christian Medical College, Ludhiana, SGS Medical College, Bombay; Field Demonstration Project, Ballabhgarh; National Institute of Virology, Pune, etc.

- It sponsors educational visits for advanced training of health professionals of India to other countries through fellowship and travel grants.
- It sponsors the visits of specialists from USA. It provides grants-in—aid to selected institutions for carrying out researches, libraries and medical education.
- It is providing active support for improvement of agriculture, family planning and rural development.

Q9. Describe Ford Foundation. *(SAMU, 2007, 2011)*

Ans: The **Ford Foundation** globally oriented private foundation was created in **1936 by Edsel Ford** and **Henry Ford**. It was the largest and one of the most influential foundations in the world with global reach and special interests in economic empowerment, education, human rights, democracy, the creative arts. **Headquarters** is in **New York, USA.**

FORD FOUNDATION

Activities are as follows:

- It established orientation training centers at Singur, Poonamallee and Najafgarh to provide training to medical and paramedical personnel all over India in Public Health.
- It helped in Research-cum-Action Projects **(RCA),** concerned environmental sanitation, design and construction of hand flush, acceptable sanitary latrine in rural areas.
- It helped in prepared Kolkata water supply and drainage scheme master plan.
- It also contributed for establishment of National Institute of Health Administration and Education (NIHAE), New Delhi, which is now known as National Institute Health and Family Welfare, which provides training for health administrators.

Q10. Describe FAO. *(ABKUB, 2008; YSRUHSAP, 2014)*

Ans: Food Agriculture Organization (FAO) was formed in the year 1945. **Headquarters** is in **Rome, Italy.**

The main aims of FAO are:

- Help nations to raise living standard.
- To improve nutrition of all people in all countries.
- To increase efficiency of farming, forestry and fisheries **(3Fs)**.
- To better the condition of rural people by widen the opportunity for productive work.
- Apart from that FAO has organized a world Freedom from Hunger Campaign (FFHC) in 1960. The main objectives of the campaign is to combat malnutrition and to disseminate information and education. FAO also collaborating with other international agencies in applied nutrition programs.

Q11. Describe ILO. *(SMU, 2009; YSRUHSAP, 2014)*

Ans: After the 1st World War in 1919, International Labour Organization (ILO) was established as an affiliate of the League of Nations to improve the working and living conditions of the working population all over the world. **Headquarters is in Geneva, Switzerland.**

The purposes of ILO are:

- To contribute to the establishment of lasting peace by promoting social justice.
- To improve through international action, labor conditions, and living standards.
- To promote economic and social stability.
- ILO also provides assistance to organizations interested in the betterment of living and employment standards. There is a close collaboration between ILO and WHO in the field of health and labor.

(KIMS, 2023)

Q12. UNDP

Ans: The **United Nations Development Programme (UNDP)** is a United Nations global development network. It helps countries eliminate poverty and achieve sustainable economic growth and human development. The UNDP was founded on 22 November 1965 with the merging of the Expanded Programme of Technical Assistance (EPTA) and the Special Fund in 1958. **Its headquarter is in New York City.** It is the largest UN development aid agency, with offices in 177 countries. The UNDP is funded entirely by voluntary contributions from UN member states.

Functions of UNDP:

1. **Democratic governance:** It supports national democratic transitions by providing policy advice and technical support, improving institutional and individual capacity within countries, educating populations about and advocating for democratic reforms.
2. **Poverty reduction:** It helps countries develop strategies to combat poverty by expanding access to economic opportunities and resources, linking poverty programs with countries larger goals and policies, and ensuring a greater voice for the poor.
3. **Crisis prevention and recovery:** It works to reduce the risk of armed conflicts or disasters, and promote early recovery after crisis have occurred.
   Example: Following the suspension of most foreign aid to Afghanistan due to its takeover by the Taliban, the UNDP took responsibility for funding most essential health services in the country, including the salaries of over 25,000 healthcare professionals.
4. **Environment and energy:** As the poor are disproportionately affected by environmental degradation and lack of access to clean, affordable water, sanitation, and energy services, UNDP seeks to address environmental issues in order to improve developing countries abilities to develop sustainably, increase human development and reduce poverty.
5. **HIV/AIDS:** It works to help countries prevent further spreading of and reduce the impact of HIV/AIDS.
6. **Human development report:** Since 1991, the UNDP has annually published the Human Development Report, which includes topics on Human Development and the annual Human Development Index.

(VBUJH, 2022)

Q13. Department for International Development (DFID)

Ans: The Department for International Development (DFID) was a ministerial department of the Government of the United Kingdom, from 1997 to 2020. It was responsible for administering foreign aid.

The goal of the department was "to promote sustainable development and eliminate world poverty". DFID was headed by the United Kingdom's Secretary of State for International Development. The UK aid logo is often used to publicly acknowledge DFID's development programmes are funded by UK taxpayers. **Its Headquarters is in London.**

The DFID's main program areas of work were Education, Health, Social Services, Water Supply and Sanitation, Government and Civil Society, economic sector (including infrastructure, production sectors and developing planning), environment protection, research, and humanitarian assistance.

In June 2020, Prime Minister Boris Johnson announced that the DFID was to be merged with the Foreign Office to create the Foreign, Commonwealth and Development Office.

SHORT NOTES AND RELEVANT QUESTIONS

Q14. What is emporiatrics?

(RGUHS, 2003; TDMGRMU, 2014, 2015)

Ans: In Greek, **'emporos'** means traveler and **'iatrike'** medicine. Emporiatics is the branch of medical science which deals with the study of health of international travelers.

Components: Medical history, Travel/exposure history, physical examination (when necessary) and immunization advise to the travelers:

- Avoid bathing with polluted water as this may result in ear, eye and skin infections.
- Excessive heat and humidity and overexertion may lead to loss of water and electrolytes.
- Use personal protective measures from mosquito bites.
- Diarrheal diseases treatment, prevention and use of ORS
- Malaria—chemoprophylaxis before traveling to endemic regions and continued till 4–6 weeks before leaving the endemic areas.
- **Hepatitis A:** Treatment and prevention.
- **Hepatitis E:** Treatment and prevention.
- **Hepatitis B:** Use of vaccine.
- **STD and HIV:** Avoidance of sex altogether or if done partner should be faithful and protected sexual activity is very important.
- **Yellow fever:** Travelers from the yellow fever endemic areas must have International vaccination certificate. Example from India to Europe nonendemic zone.
- **Tetanus:** Booster dose of tetanus toxoid every 10 years interval is recommended.
- **First-aid kit:** Carry a first aid kit containing disinfectant and dressing material, sun cream, mosquito repellent and ORS. Person suffering from chronic disease should carry enough medicine.
- **Documents:** Traveler should carry a medical record which contain about blood groups, drug allergy and other details medical history.
  - WHO publishes "International Travel and Health, vaccination Requirement and Health advice", a booklet every year which provides guidance on some of the important health risks to travelers in different parts of the world.

Q15. Difference between quarantine and isolation. *(ABKUB, 2023; TRIU, 2024)*

Points of difference	*Quarantine*	*Isolation*
Definition	It is defined as" the limitation of freedom of movement of such well persons or domestic animals exposed to communicable disease for a period of time not longer than the longest usual incubation period of the disease, in such manner as to prevent effective contact with those not so exposed"	It is defined as "separation for the period of communicability of infected persons or animals from others in such places and under such conditions, as to prevent or limit the direct or indirect transmission of the infectious agents from those infected to those who are susceptible or who may spread the agent to others"
Reason	Some infections can be spread even before a person knows he or she is sick or has any symptoms	Isolating sick people helps to prevent the spread of transmission of disease
Separated from	It separates people who have been exposed to a specific illness from others	It separates those who are already ill or infected from those who are not (cases)
Benefits	People around	Cases themselves
Where (place)	A person is usually quarantined in his or her own home	The location depends on severity of illness. It may take place at home but if it is serious place of isolation might be in hospital
Duration	Quarantine period = maximum incubation period of the disease, length of time varies depending on disease and its incubation period Sometimes, the individual and entire family may stay at home as determined by health officials	The duration of isolation will depend on the severity of illness and till recovery
Enforcement	States generally have the authority to declare and enforce quarantine within their borders	In most cases, isolation is voluntary, however, the federal, state and local governments have the authority to require isolation of sick people to protect the public
Examples	In Plague, ships, crew and travelers where detained for 40 days In COVID-19, it is 14 days	Plague, cholera, chickenpox and salmonellosis isolation done till recover. In case of COVID-19, cases are not infective after 14 days, it depends on severity of cases and till recovery as advised by the Physician

Q16. Describe isolation. *(WBUHS, 2019; BNMUB, 2020; SSUHSA, 2006, 2020; NU, 2014)*

Ans: Isolation is the oldest communicable disease control measure. It is defined as "**separation for the period of communicability of infected persons or animals from others in such places and under such conditions, as to prevent or limit the direct or indirect transmission of the infectious agents from those infected to those who are susceptible or who may spread the agent to others".**

The purpose of isolation is to protect the community by preventing transfer of infection from reservoir to possible susceptible hosts. Types of isolation varies with the mode of spread and severity of the disease. There are several types of isolation: (a) Standard isolation, (b) Strict isolation, (c) Protective isolation and (d) High security isolation. For each patient, the relative risks to the patient and to others should be assessed and appropriate type of isolation determined. Hospital isolation is however better than home isolation. Isolation is difficult in rural areas. In some situation like cholera outbreaks the entire village or rural community may have to be isolated. Isolation has a distinctive value in the control of some infectious diseases, e.g., diphtheria, cholera, streptococcal respiratory disease, pneumonic plague. Isolation has failed in the control of such diseases as leprosy, tuberculosis and STI/STDs.

Q17. Describe quarantine. *(WBUHS, 2020; BNMUB, 2020; RGUHS, 2012; TRIU, 2016, 2021; KIMS, 2022; SAMU, 2009; SSUHSA, 2009, 2020)*

Ans: It is defined as "the limitation of freedom of movement of such well persons or domestic animals exposed to communicable disease for a period of time not longer than the longest usual incubation period of the disease, in such manner as to prevent effective contact with those not so exposed".

Types of quarantine:

a. **Absolute:** Limitation of freedom of movements to prevent effective contact with those not so exposed.
b. **Modified:** Selective partial limitation of movement, such as exclusion of children from school during period of treatment such as diphtheria, chickenpox, etc.
c. **Segregated:** Separation for special consideration, control of observation of some part of a group of person or domestic animals from the others to facilitate control of a communicable disease, such as removal of susceptible children to homes of immune persons.

Q18. What is international quarantine? *(RGUHS, 2008, 2009)*

Ans: International quarantine is quarantine of an International travelers for the diseases notifiable by WHO (1983), i.e., yellow fever, plague and cholera. It is done at international airports or seaports. The first International Quarantine Rules were adopted in 1852 and are promulgated under auspices of WHO. Quarantine is done for self-survival of the nations.

Procedure:

- All travelers including infants exposed to the risk of the disease or passing through endemic zones must possess a valid International certificate of vaccination before they are allowed to enter receptive areas.
- If the travelers does not possess the certificate then he is placed under quarantine in a mosquito proof ward for 6 days for observation from the date of leaving an infected area.

Q19. Quarantine and isolation are not synonymous. *(WBUHS, 2017, 2021; AKUB, 2022; VKSUAB, 2016; GOAU, 2021)*

Ans: You are referred to previous questions.

Q20. Explain notification of disease. *(RGUHS, 2006, 2007; VKSUAB, 2019)*

International health regulation (IHR). *(WBUHS, 2023; DU, 2016; NIMSUR, 2015; MUHS, 2019; TRIU, 2020; SSUHSA, 2024)*

Ans: Overview of notification of diseases:

- Notification is compulsory reporting of a disease under legal provisions under certain times or always to the health authorities.
- The list of notifiable diseases varies from country to country.
- Multipurpose workers and village health guides are the main responsible person for notifying the disease.

Advantages:

- Notification of disease helps in prevention and/or control of the diseases.
- It provides early warnings about new occurrences or outbreaks of disease.
- It provides valuable information about fluctuation in the disease frequency.
- It is also source of morbidity data, incidence and distribution of particular disease could be measured.

Disadvantages:

- It can identify a small proportion of cases/sickness in the community.
- Under reporting is an issue.
- Many atypical and subclinical cases missed in notification process like nonparalytic polio, rubella, etc.

IHR—Referred to Q2.

Q21. Nothing on earth is more international than disease. *(WBUHS, 2024)*

Ans: In the era of globalization, with increased international travel and exchange, diseases can spread far wide rapidly. Pandemic is an epidemic of infectious diseases that crosses international boundaries. H1N1 influenza, Swine flu, HIV/AIDS, COVID-19 are examples of some pandemics. So, it can be said that nothing on earth is more international than disease.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Headquarters of WHO is situated at:** *(BNMUB, 2002; SSUHSA, 2023; VNSGUS, 2023; TRIU, 2023)*
   a. Geneva b. New York c. Washington d. London/Paris

2. **WHO day is observed on:** *(BNMUB, 2002; ABKUB, 2023; TRIU, 2023; KIMS, 2023)*
   a. 7th January b. 7th April c. 7th July d. 7th August

3. **Headquarters of UNICEF is situated at:** *(WBUHS, 2024; AKUB, 2023; BNMUB, 2002;GOAU, 2023; RGUHS, 2024; GNSUB, 2023)*
   a. Geneva b. New York c. Washington d. London

4. **UNICEF was established in the year:** *(ABKUB, 2007)*
   a. 1946 b. 1948 c. 1952 d. 1958

5. **Child health is looked after by which international organization?** *(ABKUB, 2021)*
   a. UNICEF b. UNESCO c. UNDP d. WHO

6. **GOBI campaign is promoted by:** *(TRIU, 2023)*
   a. WHO b. ILO c. UNICEF d. CARE

7. **Headquarters of ILO is situated at:** *(BNMUB, 2002, 2003)*
   a. Geneva b. New York c. Washington d. London

8. **Headquarters of Food and Agriculture Organization (FAO) is situated at:** *(ABKUB, 2016)*
   a. New Delhi b. Geneva c. Rome d. New York

9. **The headquarters of Food and Agricultural Organization (FAO) is in:** *(YSRUHSAP, 2023)*
   a. New York b. Rome c. Paris d. India

The largest voluntary organization working for the cause and care of the disadvantaged older people in India is: *(YSRUHSAP, 2023)*
a. Indian Red Cross
b. HelpAge India
c. Hind Kusht Nivaran Sangh
d. Bharat Sevak Samaj

Control hook worm infection is under_____. *(GITAMAP, 2023)*
a. WHO
b. UNICEF
c. Rockefeller Foundation
d. Ford Foundation

Restriction of activities of a contact, who has exposed to a case of communicable disease for maximum incubation period, termed as: *(AKUB, 2022)*
a. Elimination b. Quarantine c. Surveillance d. Isolation

Quarantine was first applied for: *(ABKUB,2018, 2020; AFUH, 2023)*
a. HIV/AIDS b. Tuberculosis c. Leprosy d. Plague

Quarantine period of COVID-19 is: *(VKSUAB, 2021)*
a. 6 days b. 10 days c. 12 days d. 14 days

Surveillance is necessary for all as per recommendation by WHO, *except*: *(VKSUAB, 2021)*
a. Relapsing fever b. Malaria c. Plague d. Tuberculosis

The name of Henry Dunant is known for establishment of: *(WBUHS, 2023)*
a. International Red Cross society
b. United Nations Development Program
c. Food and Agriculture Organization
d. United States Agency for International Development

The headquarter of WHO for South East Asia region is situated in: *(VBUJH, 2023)*
a. Geneva b. New York c. New Delhi d. Colombo

Priority areas of work of WHO are all, *except*: *(AKUB, 2023)*
a. Global battle against poliomyelitis
b. Child nutrition
c. Biomedical research
d. Advices governments on protection of quality of air, water and food

In GOBI-FFF campaign of UNICEF, three F denotes: *(VBUJH, 2023)*
a. Female education, Female empowerment and Female reservation
b. Female education, Family planning and Food security
c. Female education, Female fortification and Female feticide
d. Female education, Fertilizer reduction and Farming technique

In UNICEF's GOBI Campaign, O stands for: *(WBUHS, 2023)*
a. Oral contraceptives
b. Oral rehydration therapy
c. Obesity
d. Occupational hazards

Emporiatrics refers to study of: *(RUJH, 2024)*
a. Occupational disease
b. Air pollution
c. Environmental factor
d. Health of travelers

Answers:

1.	a	2.	b	3.	b	4.	a	5.	a	6.	c	7.	a	8.	c	9.	b	10.	b
11.	c	12.	b	13.	d	14.	d	15.	d	16.	a	17.	c	18.	b	19.	b	20.	b
21.	d																		

FILL IN THE BLANKS

1. WHO was established in _____. (SAMU, 2015)
2. World Health Day (WHD) is on _____. (KIMS, 2016)
3. SAARC stands for _____. (SAMU, 2016)
4. SIDA stands for _____. (SAMU, 2016)
5. CARE stands for _____. (SAMU, 2016)
6. UNICEF stands for _____. (SAMU, 2011)
7. Headquarters of FAO is in _____. (ABKUB, 2006)
8. NICD is situated at _____. (ABKUB, 2006)
9. Theme of 2016 World Health Day _____. (SAMU, 2016)
10. WHO day observed on 7 April. Theme of the WHO day for 2012 was _____. (SAMU, 2013)
11. The world's largest international source of funding for population and reproductive health program is _____. (VKSUAB, 2014)

Answers:

1. 1948
2. Seventh (7th) April
3. South Asian Association for Regional Co-operation
4. Swedish International Development Agency
5. Co-operative for Assistance and Relief Everywhere
6. United Nations Children's Fund (previously United Nations International Children's Emergency Fund)
7. Rome
8. New Delhi
9. "From Food to Plate, Make Food Safe".
10. Good Health Adds Life to Years
11. UNFPA

TRUE/FALSE

1. Emporiatrics deals with health of travelers. (SAMU, 2015)

Answer:

1. True

CHAPTER 19

Essentials Medicines and Rational Use of Drugs

CM19.1: Define and describe the concept of Essential Medicine List (EML).

Q1. Define and describe the concept of Essential Medicine List (EML). *(SDVPG, 2023; SSUHSA, 2023, 2024)*

Ans: Concept of Essential Medicine List (EML):

Drugs and medicine form a substantial proportion about 70% of out-of-pocket spending on health by households. Components of drugs and medicines form about 10% of health budget. Over 60,000–80,000 brands of medicine are available in India but only **384** are considered essential as per final essential list of medicines on 2022. WHO has its essential list of medicine **376** on 2017 **(Table 19.1)**.

The Government of India (GOI) has opened Jan Aushadhi Kendras all over India with a chain of about **8,604** medical stores to make available quality generic and other drugs available at reasonable affordable prices. Availability of essential drugs in every PHC and CHC will increase people's confidence in public health system.

The states are promoting:

- Use of generic drugs
- Rational use of drugs by adopting standard treatment guideline/protocol for common communicable and noncommunicable diseases.

Table 19.1: Essential list of medicine at subcenter (HWC).

Sl. No.	Essential items	Examples
1.	Oxygen	
2.	Lignocaine for local anesthesia	
3.	Analgesics—antipyretics and NSAID	Paracetamol, diclofenac, acetylsalicylic acid, ibuprofen
4.	Antiallergic	Cetirizine, chlorpheniramine
5.	Antihelminths	Albendazole, diethylcarbamazine
6.	Antibacterial	Amoxicillin, ciprofloxacin, gentamicin, cotrimoxazole, metronidazole
7.	Antifungal	Fluconazole
8.	Antimalarial	Chloroquine, primaquine, artesunate (A) + Sulfadoxine, pyrimethamine (B) = Combipack (A + B)
9.	Antianemia	IFA (iron + folic acid) both tablet and syrup
10.	Dermatological (tropical)	Clotrimazole cream, gentian violet, Povidone iodine
11.	Antiseptics	Hydrogen peroxide, ethyl alcohol, potassium permanganate, bleaching powder
12.	GIT/diarrhea	ORS, zinc sulfate
13.	Contraceptives	Mala-N, condom, IUD, emergency contraceptive, injectable contraceptives (Antara)
14.	Oxytocic and antioxytocic	Methylergometrine, misoprostol tablet
15.	Vitamins	Vitamin A, ascorbic acid, cholecalciferol, vitamin K
16.	Additional medicines antidotes for poisoning	Atropine, activated charcoal, snake venom antisera
17.	For ear, nose and throat	Normal saline, xylometazoline nasal drops
18.	Vaccines	Vaccines for routine immunization under UIP

ANMs have been trained under IMNCI and they trained and can administer 1st dose of antibiotic in suspected cases of neonatal sepsis (injection gentamicin) before referral. ANMs also trained on using corticosteroids in preterm labor, antibiotics for premature rupture of membranes and advance distribution of tablets misoprostol for prevention of postpartum hemorrhage and managing AEFI by use of adrenaline injection which is available in emergency kit.

Healthcare providers can indent essential drugs for treating noncommunicable diseases like hypertension, diabetes mellitus, COPD from PHC level.

CM19.2: Describe roles of essential medicine in primary healthcare.

Q2. Roles of essential medicine in primary health care. *(YSRUHSAP, 2023; GOAU, 2021; AKUB, 2024)*

Ans: Essential drugs available at subcenters and primary health centers are IFA tablets, ORS, vitamin A, contraceptives, albendazole, chloroquine, paracetamol, vaccines and chlorine tablets are live-saving drugs.

National Rural Health Mission supports provision of essential drugs and equipment to all PHCs of **18 high focus states.** These drugs are used for disease like diarrhea, pneumonia, malaria and other endemic diseases.

As the main focus of RMNCH +A is "Continuum of care", the UM Commission identified and endorsed an initial list of **13 overlooked** life-saving commodities **(Table 19.2)**.

Table 19.2: Life-saving commodities in RMNCH +A program.

RMNCH continuum of care	*Commodities*
Reproductive health	Male and female condoms, OCPs—hormonal and non-hormonal, emergency contraceptives and implants
Maternal health	Oxytocin, misoprostol, magnesium sulfate
Newborn health	Injectable antibiotics, corticosteroids, chlorhexidine, equipment for resuscitation
Child health	Amoxicillin, ORS, zinc (tablet and liquid)

CM19.3: Describe counterfeit medicine and its prevention.

Q3. Describe counterfeit medicine and its prevention.

Ans: A **counterfeit medication** or a counterfeit drug is a medication or pharmaceutical item which is produced and sold with the intent to deceptively represent its origin, authenticity, or effectiveness. A counterfeit drug may contain inappropriate quantities of active ingredients, or none, may be improperly processed within the body (e.g., absorption by the body), may contain ingredients that are not on the label (which may/may not be harmful), or may be supplied with inaccurate or fake packaging and labeling. Counterfeit drugs are related to pharma fraud. Drug manufacturers and distributors are increasingly investing in countermeasures, such as traceability and authentication technologies, to try to minimize the impact of counterfeit drugs. Antibiotics with insufficient quantities of an active ingredient add to the problem of antibiotic resistance.

India is one of the leading global producers of low cost generic medicines due to high domestic demands and inexpensive manufacturing cost. It is estimated (2012) that about 75% of counterfeit medicines supplied worldwide had some origins in India.

Manufacture and sale of counterfeit or fake medicine is a global problem but much more prevalent in developing countries like India. About 25% of drugs in India are proven to be fake, whereas in developed countries, it is as low as 1%.

Consequences of this practice could be life-threatening as these drugs may not produce the desired effects in severe diseases.

Reasons for availability of counterfeit medicines:

- Lack of consumer awareness
- Self-medication

- High cost of genuine medicines
- Prevalence of online purchase of medicines
- Difficult to detect counterfeit medicines
- Weak enforcement of legislations

Prevention of counterfeit medicines in India:

- Regulatory control over drugs
- Awareness generation on fique drugs

The Central Drugs Standard Control Organization **(CDSCO)** headed by Drugs Controller General of India regulates quality control of drugs marketed in India under the Drugs and Cosmetics Acts, 1940 and 1945 along with Drugs Control Organization in the States/UTs. These organization responsible for safety, efficacy, quality of drugs, medical devices and cosmetics.

Main functions of CDSCO:

- Manufacture, sale and distribution in the country also quality control of imported drugs.
- Coordination with States/UT Drug Control Authorities
- Approval of new drugs/vaccines manufactured and imported in the country
- State government appoints drug inspectors who lift samples of drugs for quality testing by designated state laboratory.
- CDSCO has a network of 6 Zonal Offices with 7 central drugs testing laboratories.

Standards for drugs:

- The Indian Pharmacopoeia Commission (IPC) sets the standards and quality specification of drugs and pharmaceuticals in the form of Indian Pharmacopoeia (IP)
- To ensure drugs IPC runs Pharmacovigilance Programme of India (PVPI) to protect the health of citizens of India
- Now nebulizers, BP apparatus, glucometers, thermometers have been included in the list of essential medicines/instrument under Drugs and Cosmetics Act.

Medical Stores Organization (MSO):

- Under the DGHS, MOHFW, GOI finalizes rate contracts and procurement and supply of medicines at the right time, with right quantity and right quality to various health institutions of the country through Seven (07) Government Medical Store Depots (MDSs)
- MSO also procures supply of medicines in natural calamities/disasters through local purchase.
- Through MSDs, MSO accepts drugs from various manufacturers, duly inspects each and every batch of items/medicines
- Supply of generic medicine through **AMRIT** (affordable medicines and reliable implants for treatment) at low cost

Conclusion:

- Standards treatment protocols and use of EML for treatment can reduce drug resistance in India besides saving money
- Antimicrobials should be prescribed only, when necessary, after a confirmed diagnosis.

MULTIPLE CHOICE QUESTION (MCQ)

1. **According to WHO, a medicine or drug will be termed as counterfeit in all, *except*:** *(AKUB, 2023)*
   a. Mis-lebelling b. Fuging expiry date c. Low-cost d. Insufficient ingredients

Answer:

1. c

CHAPTER

20

Recent Advances in Community Medicine

CM20.1: List important public health events of last five years.

Q1. List important public health events of last 5 years.

Ans: International events:

- ICD-11 released in 2018 to be implemented in 2022
- Ebola virus disease—declared as Public Health Emergency of International Concern in July 2019 by WHO.
- Novel Coronavirus Pandemic (Covid-19) with epicentre at Wuhan, China and spreading to 220 other countries of the world
- WHD 2021—Building a fairer healthier world for everyone to eliminate health inequities
- Vaccine against COVID-19 developed and launched in 2020
- 1st Malaria vaccine—MOSQUUIRIX approved by WHO in October, 2021
- WHO approved Covaxin for emergency use on 3rd November, 2021

National events

Natural disasters:

- Unprecedented floods in Kerala in 2018 and 2019
- Cyclone Fani stuck Odisha on May, 2019
- Supercyclone—Amphan stuck West Bengal and Odisha with massive devastation
- Severe cyclone Nisarga stuck Mumbai and Gujarat in June, 2020
- Cyclone Gulab hit Andhra Pradesh, Telangana and Odisha in September, 2021

Outbreaks/Epidemics:

- Covid-19 pandemic in 2020
- Outbreak of Nipah virus in Kerala in 2018
- JE/AES outbreak in Muzaffarpur in Bihar in 2019
- Vaccine against Covid-19 developed. India developed Covishield, Covaxin
- Zika virus disease outbreak in Kerala in July, 2021
- National Covid vaccination drive launched on 16 January, 2021

New program and policies:

- Prime Minister's Jan Arogya Yojana (PMJAY) launched in September, 2018
- National Nutrition Mission-Poshan Abhiyan and Anemia Mukt Bharat in April, 2018
- Guidelines on programmatic management of drug resistant TB in India, 2019
- All oral H mono/poly, shorter and longer MDR-TB regimen started in 2020
- CNNS survey 2016–18 released in 2019
- National Medical Commission Act, 2019
- Competency-based undergraduate curriculum rolled out along with AETCOM course in 2019-20
- Ayushman Bharat Health Infrastructure Mission (ABHIM) launched in October 2021.

Q2. Describe emerging and re-emerging diseases. *(AKUB, 2022; AFUH, 2022; VBUJH, 2022; MU, 2023; GNSUB, 2023)*

Ans: Emerging diseases:
- HIV/AIDS
- Severe acute respiratory syndrome (SARS)
- COVID-19 Pandemic
- Bird flu or avian influenza
- Pandemic influenza
- Multidrug resistant tuberculosis (MDR/XDR)
- Japanese encephalitis
- Vibrio cholerae 0139
- Leptospirosis
- Nipah virus disease
- Ebola virus disease
- Hantavirus
- Zika virus

Re-emerging diseases:
- Tuberculosis
- Cholera
- Dengue
- Malaria
- Chikungunya
- Kala-azar
- Meningococcal meningitis
- Diphtheria

Q3. Brief notes on Zika virus. *(ABKUB, 2018)*

Ans: Zika virus is a **mosquito-borne flavivirus that was first identified in Uganda in 1947**. Large outbreak was reported from Island of Yak in 2007. Brazil reported an association between Zika virus infection and Guillain-Barré syndrome and also **microcephaly in 2015**.

Problem statement: Transmission of Zika virus in 22 countries and American territories reported by WHO through International travel by mosquito vector. Lack of immunity is an important factor. Disease has not been reported in India though Dengue fever is prevalent in India.

Mode of transmission: It is transmitted through bite of an infected *Aedes* mosquito mainly ***Aedes aegypti*** transmitted from an infected pregnant mother to baby during pregnancy or at the time of birth.

Clinical feature: The symptoms are clear to Dengue which includes fever, skin rashes, conjunctivitis, musculoskeletal pain, malaise and headache, it last for 2–7 days. History of travel from an endemic areas two weeks preceding the onset of illness. Case fatality is also low.

Diagnosis: Through RT-PCR mostly.

Treatment: Symptomatic treatment, rest, plenty of fluids, use of paracetamol in severe case needs medical care, no vaccine available. NCDC, Delhi and NIV, Pune and other ten additional laboratories would be strengthened by ICMR for RT-PCR

Prevention: Control through Integrated vector management.

SWINE FLU-RELATED QUESTIONS AND ANSWERS

Q.6. Describe epidemiology, clinical features, diagnosis, management and prevention and control of Swine Flu (H_1N_1). *(BNMUB, 2015; SAMU, 2011, 2013; NU, 2015; TDMGRMU, 2009; ABKUB, 2010, 2017; RUJH, 2013)*

Ans: Epidemiology of Swine flu: Synonyms of "Swine Flu" are Pandemic Influenza or H_1N_1 flu, hog flu, pig flu. Causative agent is H_1N_1 virus responsible for 2009 pandemic. It is a zoonotic disease endemic among swine and rarely seen in humans. According to CDC, a mutant form of H_1N_1 referred to as "Nobel H_1N_1" virus was transmitted from pigs to pig handlers several months before the onset of pandemic and later spread among human population.

Major shifts in the make-up of influenza viruses occur every 20 years or so, triggering large epidemics in many parts of the world and may cause thousands of deaths. The next such shift is expected to take place very soon. The epidemic strains of influenza viruses originated from China. The influenza virus is carried by ducks, chickens and pigs and raised in close proximity to one another. Each epidemic was seen due to different strain of viruses. Currently, Avian H_5N_1 is the strain which is contagious among humans. **Pandemic influenza A (H1N1) in 2009** involved 214 countries and took 18,156 lives. They affect all age groups, since older people have not acquired immunity to them from previous infection.

Clinical features among pigs of Swine flu: It is characterized by barking cough, nasal discharge, sneezing, breathing difficulty and going off feed. Death rate is very low among pigs.

Clinical features among humans **of Swine flu:** They are classical flu like symptoms, such as fever/chills, sore throat, running nose, cough, headache and myalgia. Vomiting and diarrhea are common also.

Avian Influenza (Bird flu) *(ABKUB, 2005, 2008)*

It is the disease of bird, caused by a (H_5N_1) virus that can occasionally infect humans having significant exposure to infected birds/poultry. Highly pathogenic avian influenza (HPAI) viruses cause large scale economic loss in poultry sector. HPAI virus results in outbreak among birds.

Clinical features of avian influenza in birds: The features are ruffled feathers, soft shelled eggs, off feeds, sudden drop in egg production, inability to walk, watery diarrhea, fast breathing. Mortality is greater than 5% within few days. **Clinical features of avian influenza in humans:** High grade fever of 104°F, associated with cough, shortness of breath and diarrhea. Lower respiratory tract infection is predominant. Diarrhea occurs in 20% of cases. X-ray chest may show widespread collapse, consolidation and interstitial shadowing. Factor associated with severity of disease are old age, delay in hospitalization, enhanced lower respiratory tract infection and leukopenia. Viral replication resulted in multiorgan failure.

Laboratory diagnosis: For detection of the virus, the preference of sample is found in the following order. Endotracheal aspirate if patient is intubated, oropharyngeal swab, nasopharyngeal swab/secretions are the preferred samples.

All sample should be transported in cold chain at 0–40°C to the designated laboratory quickly. According to WHO, triple packing technique should be applied. The sample should be accompanied by clinical details with a certificate that **the sample is sent for research purpose only and not hazardous to the community.**

It has to be noted that two designated laboratories in India are National Institute of Communicable Diseases (NICD), New Delhi and National Institute of Virology, Pune, Maharashtra, India.

Biosafety measures:

- Clinical specimens should be collected by hospital staff only (not by laboratory staff), wearing personal protective equipment (PPE), such as head cover, goggles, N-95 mask, disposable gloves and disposable apron.

- Proper hand washing of all categories of laboratory staff should be done after handling the materials and leaving the laboratory.

Case management: Symptomatic treatment is given for as that of other seasonal influenza cases. Confirmed cases of H1N1 along with their contacts should be treated and subsequent disinfection is mandatory. The neuraminidase inhibitors comprising **Oseltamivir (Tamiflu)** is mostly used. Oseltamivir (Tamiflu) is available in the form of 75 mg capsule and pediatric suspension is also available in 12 mg per mL after reconstitution. Early treatment within 2 days improves survival. All doses are given twice daily for 5 days.

Q5. All influenza pandemics were caused by influenza virus A and not by B or C. Explain. *(WBUHS, 2012)*

Ans: When an epidemic is affecting a large proportion of population, occurring over a wide geographic area, such as a section of the nation, the entire nation or continent of the world, it is called pandemic. **Examples:** Pandemics caused by influenza A virus. This virus is unique among the viruses, because it is frequently subjected to antigenic variation, both major and minor. When there is a sudden, complete or major change, it is called antigenic shift. It appears to result from genetic recombination of human with animal or avian virus, providing a major antigenic change. This can cause a major epidemic or pandemic involving most or all age groups. Antigenic changes occur to a lesser degree in B group influenza viruses. Influenza C appears to be antigenically stable, so they cannot cause pandemics.

Q6. What is antigenic shift and antigenic drift? *(ABKUB, 2022; VKSUAB, 2019; RGUHS, 2003; NU, 2014; GNSUB, 2023; GOAU, 2021)*

Ans: Antigenic shift and antigenic drift are different degree of antigenic variations seen in the influenza virus. Most commonly seen in type A virus.

a. **Antigenic shift:**
   - It is an abrupt, drastic, discontinuous variations seen in the antigenic structure, resulting in a novel virus stain unrelated antigenically to predecessor strain.
   - Major antigenic change in HA (H_2 to H_3) or NA (N_1 to N_3).
   - Antibodies to predecessor virus do not neutralize the new variants
   - May lead to epidemics or pandemics.

b. **Antigenic drift:**
   - It is a gradual sequential change in the antigenic structure occurring regularly at frequent intervals.
   - It results from mutation in the HA and HN genes.
   - The new antigens though different from preceding antigen are yet related to them, so that they react with antisera to the predecessor virus strains at least to limited extent.
   - May lead to sporadic cases.

Q7. Epidemiology and prevention of Ebola virus disease. *(TDMGRMU, 2016)*

Ebola virus disease. *(DU, 2014)*

Ans: Ebola virus disease (previously known as Ebola hemorrhagic fever) is most notorious. It has stuck in Africa. Ebola first time appeared in Zaire and Sudan in 1976.

The recent epidemic started in December 2013 in Guinea and spread to South Africa. By September 2014, total 7192 cases were reported with 3286 deaths. Case fatality rate was found as high as 70%.

Clinical features: Sudden onset of fever, intense weakness, muscle pain, headache, sore throat, vomiting, diarrhea, rash, impaired kidney and liver functions and both internal and external bleeding.

Incubation period: 2–21 days and not infective during this period.

Mode of transmission: The virus is transmitted through direct contact with the blood, organs, body secretions or other body fluids of infected animals like chimpanzees, gorillas, monkeys, fruit bats, etc. Human-to-human transmission is through blood or body fluids of an infected symptomatic person or through exposure to objects, such as needles and syringes already contaminated with infected secretions.

But this is not transmitted through air, water or food.

Management: There is no specific treatment. Intensive supportive care is the only measure.

Prevention: Mortality can be reduced and spread of disease can be reduced through specific infection control measures. **Vaccine for the prevention of Ebola virus disease (EVD) (Fig. 20.1):** The US Food and Drug Administration announced today the approval of Ervebo, the first FDA-approved vaccine for the prevention of Ebola virus disease (EVD), caused by Zaire ebolavirus. The first vaccine to be approved in the United States was rVSV-ZEBOV in December 2019.

Type of vaccine: Live attenuated vaccine. It protects Zaire ebolavirus in individuals aged 18 years and older. It is important to note that thaw vial at room temperature until no visible ice is present; do not thaw vial in a refrigerator gently invert vial several times visually inspect for particulate matter and discoloration before use, vaccine is a colorless to slightly brownish-yellow liquid with no particulates visible, use the vaccine immediately after thawing.

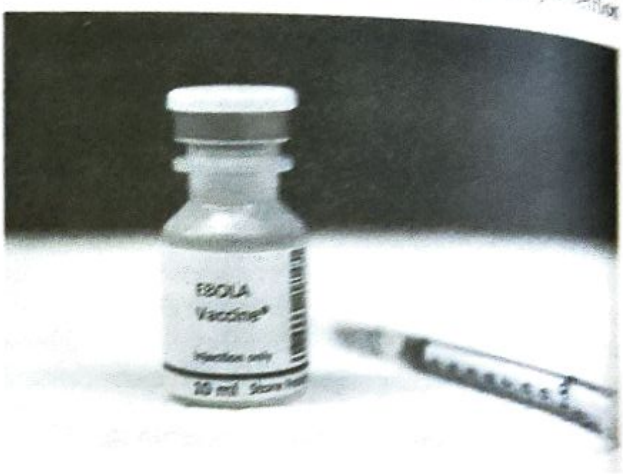


Fig. 20.1: Ebola vaccine

Route, site and dose: It is given intramuscular preferably in the deltoid area of the nondominant arm discard unused portion.

Individual less than 18 years and pregnant and lactating mother: Less than 18 years safety and efficacy not established.

Pregnancy: There are no adequate and well-controlled studies in pregnant women, and human data available from clinical trials are insufficient to establish the presence or absence of vaccine-associated risk during pregnancy.

Lactation: Human data are not available to assess the effects on milk production, its presence in breast milk or its effects on the breastfed child.

Thawed vials: If not used immediately, refrigerate at 2–8°C (35.6–46.4°F) for a total time of no more than 2 weeks and at room temperature (up to 25°C; 77°F) for a total time of no more than 4 hours.

Q8. Discuss bioterrorism. *(ABKUB, 2018; TRIU, 2022; PBDSUHSU 2017)*

Ans: Biological warfare seems to have been existing since 600 BC—Roman Generals poisoned water by dumping rotting animal carcasses for the enemies. In Scythia 400 BC arrows were used dipped in blood. Hannibal in 190 BC venomous snakes in Roman ships. Ukraine in 1346, catapulted bodies of plague victims into the city of Kaffa. In 1954–1967, blankets infested with smallpox were distributed to American Indians during the French and Indian war. 1932, the Japanese experimented on Chinese by using anthrax, cholera and shigellosis. In 1984 in Dalas, salad contaminated with ***Salmonella typhimurium*** was used to influence the results of election.

Anthrax contaminated letter was posted to politicians. In September 11, 2001, terrorist used nuclear, chemical and biological weapons to attact World Trade Center in New York.

Evolution of chemical and biological weapons:

Phase I: Gaseous chemical like chlorine and phosgene were used in World War I

Phase II: Use of nerve agents—tabun and anthrax and plague in World War II

Phase III: Herbicides were used causing crops destruction

Phase IV: Biotechnological and genetic engineering revolutions are in progress.

Merits:
- Low cost
- Large quantities can be produced in short span of time with small facilities
- Nondetection by routine security system (biosensor)
- Very toxic, small quantities are sufficient to kill large number of persons

Demerits:
- Difficulty in protecting workers during production, transportation and delivery
- Difficulty in quality control, contaminated during growth and harvesting
- Difficult to control once released

Top biological weapons:
- *Bacillus anthracis*
- *Yersinia pestis*
- *Clostridium botulinum*
- *Vibrio cholerae*
- Variola virus

OK20.2: Describe various issues during outbreaks and their prevention.

Q9. Describe various issues during outbreaks and their prevention.

Ans: **Issues related to detection of an outbreak:**

Denial: The important reasons for hiding and denying outbreaks could be:
- No skills to investigate
- Additional work
- Press pressure
- Fear of sanctions

Outbreaks are only investigated when there is a large cluster, which shows that the system is reactive only or the system acts under pressure when most cases have occurred or else the system never investigates and denies the occurrence of outbreak.

Remedial measures: Technical training, guidance and motivation of the staff is very important. Investigation methods can be learned and detection becomes easier with practice.

A. **Weak or inadequate surveillance system for early detection of outbreaks:** Though the IDSP is in place since 2004, the surveillance system for epidemic prone diseases tends to be very weak in ground situation. Medical offices do not write the diagnosis in the OPD register. Few lacunae are discussed below:
   - Data is not compiled and not looked into before transmission to district surveillance officers (weekly reports on P, S and L-form.
   - Data is not analyzed locally to detect outbreaks and seasonal variations at early stage. Early warning signals, such as clustering of cases or deaths, increase in cases or deaths are mostly ignored.
   - Reports on surveillance by various units are not in time and are incomplete.
   - Local communities and informants system is poorly developed.

Remedial measures:
- Timely upgradation of IDSP registers
- Strengthening of surveillance systems by supportive supervision and motivation
- Use of locally collected data for planning of program and early response.

B. **Issues related to health systems:**
   - IDSP works through existing health system of village, subcenters, PHCs and CHCs, urban health centers and Sentinel hospitals. In many of the areas, health workforce/human resources are deficient. Thus, the system is not functioning properly as a result early detection of outbreaks and quick response is absent.

- Involvement of private health providers/practitioners: Because of inefficient Government Health System people turn to private health providers and these providers treat over 70% of spells of sickness, hence their capacities for early detection of outbreaks, disease notification and control and prevention must be fully utilized. These providers are need to be provided upgraded national guidelines on control and prevention of outbreaks by organizing short-term training through various professional bodies.

CM20.3: Describe any event important to health of the community.

Q10. What is COVID-19 infection, clinical features of it, different modes of transmission of COVID-19 infection, diagnosis, high-risk groups, discuss its management and prevention.

(WBUHS, 2021; MGUB, 2022; SSUHSA, 2020; ABKUB, 2023; TRIU, 2022; RUJH, 2021; RGUHS, 2024)

Ans: **Novel coronavirus (nCoV)** is a provisional name given to coronaviruses of medical significance before a permanent name is decided upon.

The name "coronavirus" is derived from Latin corona, meaning "crown" or "wreath", itself a borrowing from Greek κορώνη korōnē, "garland, wreath". The scientific name Coronavirus was accepted as a genus name by the International Committee for the Nomenclature of Viruses (later renamed International Committee on Taxonomy of Viruses) in 1971. In December 2019, a pneumonia outbreak was reported in Wuhan, China. On 31 December 2019, the outbreak was traced to a novel strain of coronavirus, which was given the interim name 2019-nCoV by the World Health Organization (WHO), later renamed SARS-CoV-2 by the International Committee on Taxonomy of Viruses.

The COVID-19 pandemic in India is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). **The first case of COVID-19 in India, which originated from China, was reported on 30 January 2020.**

Most common symptoms: Fever, dry cough, tiredness

Less common symptoms: Aches and pains, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, a rash on skin, or discoloration of fingers or toes

Serious symptoms: Difficulty breathing or shortness of breath, chest pain or pressure, loss of speech or movement, seek immediate medical attention if you have serious symptoms, always call before visiting your doctor or health facility. Some symptoms of COVID-19 can be relatively non-specific; the two most common symptoms are fever (88%) and dry cough (68%). Among those who develop symptoms, approximately one in five may become more seriously ill and have difficulty breathing. Emergency symptoms include difficulty breathing, persistent chest pain or pressure, sudden confusion, difficulty in waking, and bluish face or lips; immediate medical attention is advised if these symptoms are present. Further development of the disease can lead to complications including pneumonia, acute respiratory distress syndrome, sepsis, septic shock, and kidney failure.

People with mild symptoms who are otherwise healthy should manage their symptoms at home.

On average, it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

Incubation period: As is common with infections, there is a delay, known as the incubation period, between the moment a person first becomes infected and the appearance of the first symptoms. The median incubation period for COVID-19 is 4–5 days. Most symptomatic people experience symptoms within 2–7 days after exposure, and almost all symptomatic people will experience one or more symptoms before days 12.

Different mode of transmission of COVID-19 infection:

- COVID-19 spreads most often when people are physically close.
- It spreads very easily and sustainably through the air, primarily via small droplets or aerosols, as an infected person breathes, coughs, sneezes, sings, or speaks.

- It may also be transmitted via contaminated surfaces, although this has not been conclusively demonstrated.
- Airborne transmission from aerosol formation is suspected to be the main mode of transmission.
- It can spread from an infected person for up to 2 days before they display symptoms, and from people who are asymptomatic.
- Causing airborne transmission particularly in crowded and inadequately ventilated indoor spaces, such as restaurants, nightclubs or choirs.
- People remain infectious for 7–12 days in moderate cases, and up to two weeks in severe cases
- Kissing, physical intimacy and other forms of direct contact can easily transmit the virus and thus lead to COVID-19 in people exposed to such contact.
- It may be possible that a person can get COVID-19 through indirect contact by touching a contaminated surface or object, and then touching their own mouth, nose, or possibly their eyes, though this is not thought to be the main way the virus spreads.
- There currently is no significant evidence of COVID-19 virus transmission through feces, urine, breast milk, food, wastewater, drinking water, animal disease vectors, or from mother to baby during pregnancy, although research is ongoing and caution is advised.

Diagnosis: The standard method of diagnosis is by real-time reverse transcription polymerase chain reaction (rRT- PCR) from a nasopharyngeal swab. Results are generally available within a few hours to 2 days. Antibody tests may be most accurate 2–3 weeks after a person's symptoms start.

High-risk groups:

- Front line works like physicians, nurses, health workers and safai karamchari are more prone to develop COVID-19 infection
- The following disease and condition may cause severe form of COVID-19 infection:
  - *Cancer:* Treatments for many types of cancer weaken body's ability to fight
  - Chronic kidney disease
  - Chronic lung diseases, including COPD (chronic obstructive pulmonary disease), asthma (moderate-to-severe), interstitial lung disease, cystic fibrosis, and pulmonary hypertension
  - Dementia or other neurological conditions
  - Diabetes (type 1 or type 2)
  - Down syndrome
  - Heart conditions, such as heart failure, coronary artery disease, cardiomyopathies or hypertension
  - Stroke or cerebrovascular disease, which affects blood flow to the brain
  - HIV infection
  - *Immunocompromised state:* Many conditions and treatments can cause a person to be immunocompromised or have a weakened immune system. Primary immunodeficiency is caused by genetic defects that can be inherited. Prolonged use of corticosteroids or other immune weakening medicines can lead to secondary or acquired immunodeficiency.
  - *Liver disease:* Chronic liver disease, such as alcohol-related liver disease, nonalcoholic fatty liver disease, and especially cirrhosis, or scarring of the liver.
  - *Overweight and obesity:* Overweight (defined as a body mass index (BMI) >25 kg/m^2 but <30 kg/m^2), obesity (BMI ≥30 kg/m^2 but <40 kg/m^2), or severe obesity (BMI of ≥40 kg/m^2) are ca more likely to get severely ill from COVID-19. The risk of severe COVID-19 illness increases sharply with elevated BMI.
  - Pregnancy are more likely to get severely ill from COVID-19 compared with non-pregnant people.
  - Sickle cell disease or thalassemia
  - Smoking, current or former can make more likely to get severely ill from COVID-19. If you currently smoke, quit. If you used to smoke, do not start again. If you have never smoked, do not start
  - Solid organ or blood stem cell transplant
  - Substance use disorders, such as alcohol, opioid, or cocaine use disorder

Prevention: Recommended measures to prevent infection include frequent social distancing, quarantine, covering coughs and sneezes, hand washing, and keeping unwashed hands away from the face. Social distancing **and the** wearing of cloth face masks, surgical masks, respirators, or other face coverings **are controls for droplet transmission.**

Personal protective equipment: For healthcare professionals who may come into contact with COVID-19 positive bodily fluids, using personal protective coverings on exposed body parts improves protection from the virus.

Face masks/Mask is the best vaccine for COVID-19 disease. *(AKUR, 2022)*
The World Health Organization (WHO) and most government health agencies [such as the US Centers for Disease Control and Prevention (CDC), the UK National Health Service (NHS), or the New Zealand Ministry of Health] recommend individuals wear non-medical face coverings in public settings where there is an increased risk of transmission and where social distancing measures are difficult to maintain. Face coverings limit the volume and travel distance of expiratory droplets dispersed when talking, breathing, and coughing. Many countries and local jurisdictions encourage or mandate the use of face masks or cloth face coverings by members of the public to limit the spread of the virus. Masks are also strongly recommended for those who may have been infected and those taking care of someone who may have the disease.

Social distancing: Social distancing strategies aim to reduce contact of infected persons with large groups by closing schools and workplaces, restricting travel, and canceling large public gatherings. Distancing guidelines also include that people stay at least 2 meters (6.6 ft) apart.

Hand-washing and hygiene: WHO also recommends that individuals wash hands often with soap and water for at least 20 seconds, especially after going to the toilet or when hands are visibly dirty, before eating and after blowing one's nose. The CDC recommends using an alcohol-based hand sanitizer with at least 60% alcohol, but only when soap and water are not readily available.

Co-morbidities: Most of those who die of COVID-19 have pre-existing (underlying) conditions, including hypertension, diabetes mellitus, and cardiovascular disease.

Complications: It may include pneumonia, acute respiratory distress syndrome (ARDS), multiorgan failure, septic shock, and death. Cardiovascular complications may include heart failure, arrhythmias, heart inflammation, and blood clots. Approximately 20–30% of people who present with COVID-19 have elevated liver enzymes reflecting liver injury. Neurologic manifestations include seizure, stroke, encephalitis, and Guillain–Barré syndrome (which includes loss of motor functions). Following the infection, children may develop pediatric multisystem inflammatory syndrome, which has symptoms similar to Kawasaki disease, which can be fatal.

Management: People are managed with supportive care, which may include fluid therapy, oxygen support, and supporting other affected vital organs.

Remdesivir was approved for medical use in the United States in October 2020. It is the first treatment for COVID-19 to be approved by the US Food and Drug Administration (FDA). It is indicated for use in adults and adolescents [aged twelve years and older with body weight at least 40 kilograms (88 lb)] for the treatment of COVID-19 requiring hospitalization.

Several existing medications are being evaluated for the treatment of COVID-19, including **remdesivir, chloroquine, hydroxychloroquine, lopinavir/ritonavir, and lopinavir/ritonavir combined with interferon beta, azithromycin, doxycycline, favipiravir, dexamethasone,** heparin and **tocilizumab.**

Convalescent plasma therapy: Transferring purified and concentrated antibodies produced by the immune systems of those who have recovered from COVID-19 to people who need them is being investigated as a nonvaccine method of passive immunization. The safety and effectiveness of convalescent plasma as a treatment option requires further research.

Available vaccines against COVID-19: *(AKUB, 2022; SSUHSA, 2022; VBUJH, 2023; GOAU, 2021; RUJH, 2024)*

Name of the vaccine	Type	Company	Doses/Day	Route	Beneficiary
Covaxin	Inactivated novel corona virus	Indigenous—Bharat Biotech (Hyderabad)	2 doses (0, 28)	I/M 0.5 mL	6 years and above
Covishield	Vector (Ch Ad virus) based spike protein	University of Oxford and AstraZeneca and Serum Institute of India (SII)	2 doses (0, 84)	I/M 0.5 mL	18 years and above
Sputnik V	Vector (Ch Ad virus) based spike protein	Gamaleya research institute, Russia	2 doses (O, 21)	I/M 0.5 mL	18 years and above
iNCOVACC	Vector vaccine (adenovirus)	Bharat Biotech	2 doses (0, 28)	Intranasal 0.5 mL (8 drops)	18 years and above
ZyCoV-D	DNA based	Zydus Cadila (Ahmedabad)	3 doses (0, 28, 56) of 2 mg each	Needle free applicator (Jet)	12 years and above
mRNA-1273 vaccine	mRNA	USA-based Moderna	2 doses (0, 28)	I/M 0.5 mL	5 years and above
Tozinameran BNT162b2 vaccine	mRNA	USA-based Pfizer–BioNTech	2 doses (0, 28)	I/M 0.5 mL	5 years and above
Corbevax	Recombinant protein Subunit vaccine	Biological E Hyderabad	2 doses (0, 28)	I/M 0.5 mL	5 years above
Covovax	Recombinant protein Subunit vaccine	NOVAVAX (American) and Serum Institute of India (SII)	2 doses (0, 21)	I/M 0.5 ml	12 years and above

Covid 19 vaccines commonly used in India:

- Covishield
- Covaxin
- Corbevax

CM20.4: Demonstrate awareness about laws pertaining to practice of medicine such as Clinical Establishments Act and Human Organ Transplantation Act and its implications.

Q11. Demonstrate awareness about laws pertaining to practice of medicine such as Clinical Establishments Act and Human Organ Transplantation Act and its implications.

Ans: Transplantation of Human Organ Act, 1994, amended in 2011 and 2014, now known as THOTA:

Implications: A large number of persons suffer from end-stage organ failure, they require transplantation. There is huge gap between the requirement of organs and their availability. There is also a threat of commercial dealing in organs. Transplantation of Human Organs Act, 1994, was, therefore, enacted to regulate removal, storage and transplantation of human organs for therapeutic purposes and for prevention of commercial dealings in human organs. The Act has been adopted by all states and UTs except Jammu and Kashmir, Andhra Pradesh and Telangana. The amended Act and Rules thereunder provide for inclusion of tissues in the Act along with organs. Act expands the definition of "near relatives" to include grand children and grand parents.

Implementation of Act: GOI is implementing National Organ Transplant Programme (NOTP) to retrieve, store and transport of organs, training of manpower and awareness generation to promote organ donation from deceased persons. There is need to promote organ donation from deceased (cadaveric) donors rather than relying on living donors, because of commercial trading and increased risk of health of living donors. Under the program, an apex level organization, viz, National Organ and Tissue Transplant Organization (NOTTO) has been set up at Safdarjung Hospital at New Delhi.

Clinical Establishments Act (CEA), 2010: The Act is for registration and regulation of the clinical establishments (excepts those of armed forces), with an objective to prescribe minimum standards of facilities and services. Recognized qualifications of person in-chage of clinical establishment have been specified. The Ministry of Health and Family Welfare has notified clinical establishments.

A. **National Council for Clinical Establishments (NCCE):** Under the chairmanship of DGHS, this body performs the following functions. State councils for clinical establishments have been also constituted.
- Compiling and Publishing National Register of Clinical establishments
- Classify the clinical establishment into different categories
- Develop the minimum standards for establishments and their periodic review
- Determine the 1st set of standards for ensuring proper health care
- Collect statistics on regular basis

B. **Implementation:**
- Facility for online registration for clinical establishments
- Operational guidelines for minimum standards have been issued for implementing states
- Standard treatment guidelines (STGs) under National Health Programs have been compiled and uploaded
- STGs for Ayurveda have been compiled
- List of medical treatment and standard template of costing of procedures and services has been prepared and states have been advised to use it.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. Incubation period of SARS is: *(BNMUB, 2002)*
a. 3–10 days b. 15–18 days c. 30 days d. None of the above

2. Incubation period of meningococcal meningitis is: *(BNMUB, 2002, 2006)*
a. 3–4 days b. 5–8 days c. 30 days d. None of the above

3. Ebola virus disease is transmitted by: *(YSRUHSAP, 2023)*
a. Droplet infection
b. Droplet nuclei infection
c. Direct contact with body fluids
d. Fomites

4. Following health event did not occur in last 5 years: *(AKUB, 2023)*
a. MCI is replaced by NMC
b. RNTCP renamed NTEP
c. Elimination of Polio from our country
d. Covid Vaccine [Covaccine] produced by Bharat Biotech

5. Which of the following re-emerging diseases led to large-scale deaths due to pneumonias in India? *(TRIU, 2023)*
a. COVID-19
b. Swine (H_1N_1) influenza
c. Plague
d. Tuberculosis

6. Major reason for H_5N_1 not to become a global pandemic is: *(RUJH, 2024)*
a. Route of transmission is not respiratory
b. Man to man transmission is rare
c. Does not cause serious disease among humans
d. Restricted to few countries only

Answers:

1. a **2.** a **3.** c **4.** c **5.** b **6.** b

CHAPTER 21

AETCOM

Q1. What are the rights of a physician and patient?

Ans: Physician's rights:

- Physicians recognize and support the rights of their patients.
- Physicians will enjoy the professional freedom to care for their patients without interference. The physician's professional judgement and discretion in making clinical and ethical decisions in the care and treatment of patients must be preserved and protected.
- Physicians must have the professional independence to represent and defend the health needs of patients.
- Physicians should not be expected to administer governmental or social priorities in the allocation of scarce health resources within the context of their medical practice and the care of their patients.
- It is the physician's primary obligation to represent the interests of the sick and injured against demands by society for cost containment that would endanger patients' health and perhaps patients' life.

A community assures the best possible healthcare for its citizens by providing independence and professional freedom for physicians to practice medicine.

Patient's rights:

Highlighting salient features of patient's right:

a. Right to information
b. Right to records and reports
c. Right to emergency medical care
d. Right to informed consent
e. Right to confidentiality, human dignity and privacy
f. Right to second opinion
g. Right to transparency in rates, and care according to prescribed rates wherever relevant
h. Right to nondiscrimination
i. Right to safety and quality care according to standards
j. Right to choose alternative treatment options if available
k. Right to choose source for obtaining medicines or tests
l. Right to proper referral and transfer, which is free from perverse commercial influences
m. Right to protection for patients involved in clinical trials
n. Right to protection of participants involved in biomedical and health research
o. Right to take discharge of patient, or receive body of deceased from hospital
p. Right to patient education
q. Right to be heard and seek redressal

Q2a. Enumerate and describe the roles of an Indian Medical Graduate.

(WBUHS, 2023; MGUB, 2023, 2024; TRIU, 2023; AKUB, 2023)

Ans: An Indian Medical Graduate (IMG) must be able to function in the following roles in the appropriate and effective way.

The roles as depicted in AETCOM are as follows: These five roles are essentially played by an IMG who will lead our society with good health of general population.

1. **Clinician:** The doctor is the clinician who understands and provides preventive, promotive, curative, palliative and holistic care with compassion.
2. **Leader and member of the healthcare team and system:** Indian Medical Graduate will be leader and member of the healthcare team and system with capabilities to collect, analyze, synthesize and communicate health data appropriately with the social leader and general people.
3. **Communicator:** A doctor should be a good communicator with patients, families, colleagues and community so that people can play their role as per instructions given by an IMG.
4. **Lifelong learner:** Body of scientific knowledge is ever changing due to evolving of newer ideas and newer evidence. An IMG should be committed to continuous improvement of skills and knowledge. Stale knowledge will not help the patients and accordingly community. Newer scientific knowledge will be applied in the sufferings of patients.
5. **Professional:** A doctor is a person with a technical training for a specified period and he is committed to excellence, is ethical, responsive and accountable to patients, community and profession.

Q2b. Basic qualities of a good physician. *(MGUB, 2024)*

Ans: Qualities of a good physician are:

- Academic excellence and competency
- Strong work ethic
- Professionalism
- Excellent communication skills
- Good organizational skills
- Empathy
- Compassion

Q3. What is the importance of lifelong learning of a physician. *(MGUB, 2024; RUJH, 2024)*

Ans: Lifelong learning of a physician means reading journals, articles on medicine, newer books etc, till the time of end of medical practices. He should be knowledgeable and adapted with the newer skills which will help the patients' relief, reduce duration of sufferings, increase the relation between doctor and patients, reduce economic loss of the patients, etc.

- Lifelong learning of a physician increases the ability to perform an objective self-assessment of current knowledge and skills. It promotes the continual medical learning. This will help refine existing skills and acquire new skills of a physician.
- Lifelong learning of a physician increases the ability to apply newly gained knowledge or skills to the care of the patient leaving aside the previous stale information to reduce the suffering period with speedy recovery.
- Lifelong learning of a physician motivates him and enhances the ability to introspect and utilize experiences, to enhance personal and professional growth and learning.
- Lifelong learning of a physician increases the ability to search the solution with more vivid information (including through electronic means), and critically evaluate the medical literature and again apply the information in the care of the patient.
- Physicians will be able to identify and select an appropriate career pathway that is professionally rewarding and personally fulfilling his dream or necessity.
- Thus, lifelong learning of a physician helps him for the benefit of patient and by large for the benefit of society and for himself in long run.

Q4. What do you understand that "health is our right"? *(AKUB, 2024)*

Ans: The right to health means that everyone should have access to the health services they need, when and where they need them, without suffering from any kind of financial hardship. Nobody should die just because they are poor or they cannot access the health services they need. There is no right to health by individuals in the Indian constitution. Article 36(3) of our constitution emphasizes the obligation to protect the health of the

nation by stipulating that all citizens are protected by the state in relation to health. This means that the right to health as a social fundamental right is the most important aspect of health rights. The Supreme Court of India has interpreted the constitution's article on the protection of life and personal liberty so as to include access to healthcare into the article's scope.

So, it can be said that health is a fundamental human right indispensable for the exercise of other human rights. Every human being is entitled to the enjoyment of the highest attainable standard of health conducive to living a life in dignity. Citizens should be healthy enough to develop nation.

The WHO Constitution states that the enjoyment of the highest attainable level of health is a fundamental right of every human being. As a result, adopting a human-rights-based approach to health is critical to achieving health for all by a certain time period.

Access to adequate healthcare facilities and services as well as appropriate state measures in relation to the socio-economic determinants of health, such as food, water and sanitation, safe and health working conditions, housing, poverty, etc., will help protect citizens of the country.

No person shall be deprived of his life or personal liberty except according to procedure established by law.

Healthcare services must be present each and every corner of the country so that no person will be denied of healthcare in necessity. Services should be available, accessible, affordable to the community. Economically, out of pocket expenditure should be minimum and the cost borne by them should not cause burden to the individual or family.

Healthcare providers should be socially conscious. Human touch will encourage the people to participate in the healthcare delivery system.

Health is the principal and chief wealth of individual and society and its availability will help keep the health of the people well. This provision of healthcare delivery may be reflection of health right of the individual.

To stay healthy is right to individual and summarily health becomes right of the individual and society.

Q5. Elaborate the concept of fiduciary duty. Identify, discuss and defend medicolegal, sociocultural, professional and ethical issues as it pertains to the physician-patient relationship (including fiduciary duty).

Ans: A fiduciary is a person or organization that acts on behalf of another person or persons, putting their clients' interests ahead of their own with a duty to preserve good faith and trust.

Fiduciary duty refers to the relationship between a fiduciary and the principal or beneficiary on whose behalf the fiduciary acts. Fiduciary duty is one of the highest and most respected obligations. Fiduciaries are paid to work. However, they are also tasked with the responsibility of being the eyes and ears of their client, working to secure the client's desired outcomes without any promise of additional compensation for doing so.

Relationship between a doctor and a patient is similar to fiduciary duty where patients are beneficiary and doctors are trustees or fiduciary.

Surgical operation on a patient is a medicolegal issue where informed voluntary consent should be taken from patient. This consent is essential before any kind of operational procedure. Thus, patients' rights are reserved and their health remains their own concern preserving medicolegal issues.

Attention should be paid for sociocultural matters. Patient may go for praying to God with folded hands before operation and that should be allowed.

Physicians being surgeon should perform their duties with full consciousness utilizing their skills and knowledge. Surgical operation is a serious issue. Doctors should not talk loose and paying full attention, the patients should be advised according to the situation.

The physicians cannot cause harm to the patients. For the sake of survival, organ of patients may be sacrificed but permission should be sought from awaken patients or patients' parties. Thus, ethical issues can be taken care of.

In any of medical services, medicolegal, sociocultural, professional and ethical issues appear at the service time and all these issues should be taken care of with passion and empathy.

Q6. Discuss 7 steps of effective communication.

Ans: Seven essential sets (steps) of communication are (1) build the doctor—patient relationship; (2) open the discussion; (3) gather information; (4) understand the patient's perspective; (5) share information; (6) reach agreement on problems and plans; and (7) provide closure.

The list is essentially exhaustive but the intent was to make it easier for people working in this area to identify not only the key tasks, but the relevant knowledge, skills, and attitudes as well. These seven steps are genuinely sorted to make communication easier. This short list of elements that would characterize effective communication in several clinical contexts was accepted in Kalamazoo consensus as noted by Makoul and Schofield.

1. **Build a relationship:** A fundamental task is a strong, therapeutic and effective relationship of the physician—patient communication. This requires eliciting the patient's story of illness while guiding the interview through a process of diagnostic reasoning, requires an awareness that the ideas, feelings, and values of both the patient and the physician influence the relationship.
2. **Open the discussion:** The patient is allowed to complete his or her opening statement, elicit the patient's concerns, establish/maintain a personal connection.
3. **Gather information:** Appropriate open-ended and closed-ended questions are used. Information is structured, clarified and summarized. Active listening is required using nonverbal and verbal techniques.
4. **Understand the patient's perspective:** Contextual factors (family, culture, gender, age, socioeconomic status, spirituality, etc.), beliefs, concerns and expectations are explored. The patient's ideas, feelings, and values are acknowledged and responded accordingly.
5. **Share information:** Language is used so that the patient can understand. Questions are encouraged. Patient's understanding will be checked.
6. **Reach agreement on problems and plans:** The patient is encouraged to participate in decisions. The patient's willingness and ability will be checked to follow the plan. Resources and supports will be identified and enlisted.
7. **Provide closure:** The patient may be asked whether he has other issues or concerns. Agreement will be summarized and affirmed with the plan of action. Next visit, plan for unexpected outcomes may be discussed.

Q7. What are fundamentals of a good doctor-patient relationship? Why this communication is important? *(TRIU, 2023)*

Ans: A doctor-patient relationship (DPR) is considered as the core element in the ethical principles of medical practice. DPR is usually developed when a physician is interacting with a patient and his medical needs via check-up, diagnosis and treatment in an agreeable manner. Behavior of a doctor in response to patient's query follows certain basic principles which are fundamental rights and duties in doctor-patient relationship.

Fundamentals of DPR:

- **Empathy:** Empathy is required to play a very important role in improving the doctor-patient relationship. Empathy helps the doctor to understand the symptoms in a better way that the patient has got and also the need for the treatment.
- **Trust:** The trust is the most important thing in doctor-patient relationship. Trusting a particular doctor helps the patient to discuss the health issues openly. The patient should not have blind trust. Queries can be raised by the patient to understand the issues correctly.
- **Consent information:** This is based on the moral and legal arguments of the patient's autonomy (independence in decision making). The doctor here should consult the family members of the patient and counsel them on the positive as well as negative outcomes of the treatment. The patient should have complete independence in decision to receive or to continue the treatment or to reject the treatment or taking discharge or moving to any other hospital or even taking the second opinion from any other doctor.

- **Professional boundaries:** The doctor should deal in such a manner with a patient that crossing the limits of the relationship in the professional areas may hinder the treatment. Staring at a patient in an inappropriate manner, burdening the patient with unnecessary personal information should be avoided by the doctors.
- **Communication:** Communication plays a vital and key role in the doctor-patient relationship. Both the patient as well as the doctor should have communication skills. The patient should be able to explain (narrating skills) what health difficulty he/she is facing and it would be followed by the doctor who should have good listening skills with patience and care. At the end, the doctor should be able to explain the problem of the patient elaborately and also suggest him/her the necessary solution.
- Communication helps the patient or family member of the patient receive the treatment, interact in future visit, visit regularly in future health problems, etc. Trust will be developed through communication. Understanding may be checked through it. So, this is very vital in patient management.

Q. Explain nonjudgmental and empathetic manner to be employed while communicating with a patient. *(SSUHSA, 2024)*

Ans: Communication skill is a fundamental prerequisite of the medical profession and effective communication is crucial in ensuring professional success for doctors. This is expectation of the society that one Indian Medical Graduate will communicate to patients in a patient, respectful, nonthreatening, nonjudgmental and empathetic manner.

It is not too hard to be nonjudgmental all the time. We should be cautious to make judgments about people from the time we meet them in the beginning based on his appearance, behavior and their statement. Though judgments are going on in our mind, but negative statement should be avoided. Positive statement may get in the way of helping someone in need.

It is important to maintain a positive attitude and open mind to be supportive in any form of communication.

Few things should be observed in nonjudgmental listening in communication.

a. **Reflect on own state of mind:** We should be in the right frame of mind to talk and listen without being judgmental. Communicator should feel calm, be open and ready to help the patient in need.
b. **Adopt an attitude of acceptance, genuineness and empathy:** Respect must be shown to the person's feelings, personal values and experiences as valid. Their statement may be different from own or we may disagree with them. Place self in their position and this placement can help you be more genuine and empathic.
c. **Use verbal skills to show that you are listening:** We should actively listen. This includes asking short questions, nonverbal cues, prompting like "I see" and "ah", etc. Noninterruption of narration of the person should be ensured to give them time to express their thoughts and feelings.
d. **Maintain positive body language:** This includes comfortable eye contact, sitting down at patients level and alongside and angled toward the patient.
e. **Recognize cultural differences:** We should be prepared to discuss what is culturally appropriate and realistic for the patient before engaging with him or her.

In communication, listening with empathy can help others feel welcomed, safe, comfortable and secured. The patients may feel comfortable in expressing themselves freely and openly. Some principles can be followed to ensure empathy in communication.

a. Pay attention to subtle things.
b. Pay attention to their body language, tone of voice, and subtle changes in facial expressions. Such signals can add in interpretation what they mean and how they feel.
c. Try to see things from their point of view
d. Imagine self in their place, walking a mile in their shoes, and feeling what they feel.
e. Be present in all the moments of communication.
f. Validate their emotion
g. Listen without judging what the patient says.
h. Be patient and respectful

i. Let the patient speak at their own pace, and recognize that it might be challenging if they are sharing something difficult.
j. Remember that each patient's live experience is different from communicator.

So, these are the issues which can act as principles for nonjudgmental and empathetic manner to be employed while communicating with a patient.

Q9a. What is the importance of confidentiality in healthcare practices (doctor-patient relationship)? *(SSUHSA, 2023)*

Ans: Patient confidentiality refers to the right of patients to keep their records private. It represents physicians' and medical professionals' moral and legal obligations in handling patients' sensitive medical and personal information. The information given by patient cannot be shared with other.

Ignoring patients' rights to confidentiality would lose their trust, and might prevent people from seeking help from healthcare providers when needed. Confidentiality preserves individual's dignity, prevents information misuse, and protects autonomous decision making by the patient so that he can move fearlessly.

The term 'confidentiality' means preserving authorized restrictions on access and disclosure of patient's information including means for protecting personal privacy. Violation of confidentiality usually leads to large fines and can involve jail.

Q9b. What are the exceptions of confidentiality in healthcare practices? *(SSUHSA, 2023)*

Ans: Exceptions to patient confidentiality:

According to the American Academy of Family Physicians (AAFP), **four exceptions to patient confidentiality** can be practiced.

1. A medical-care provider can disclose private and confidential information to another physician. This can only happen when one doctor needs to ask another if the doctor needs advice on the treatment process.
2. If there's a compelling circumstance that affects the patient's health and safety in an emergency management.
3. Sometimes a court order or statute requires reporting of a specific diagnosis to a public health authority. This may happen in case of a court trial or a police investigation.
4. A court order or statute may require a doctor to release a medical record to law enforcement or another legal entity. These are probably issued for similar reasons to the situation above.

Few other reasons not outlined by the AAFP (Department of Health and Human Services):

The commonly encountered reasons are (a) scenarios of abuse, negligence and domestic violence (b) determinations of cause of death, (c) organ donation, (d) research that's designed to contribute to generalizable knowledge, (e) essential government functions like national security activities, (f) workers compensation law, and (g) limited data set.

Second opinion: Doctors may discuss a diagnosis with colleagues if the disclosure is necessary for treatment of the treatment to the least amount possible. These disclosures are necessary for the successful treatment of a patient. Therefore, they're legally permissible.

Public health crisis: If the disclosure can protect the general people from a health crisis, then doctor should do that.

If a contagious disease that can have lasting side effects or a concerning mortality rate, the doctor needs to tell the public about the situation to avoid large consequences.

Elderly neglect: Doctors can share information with the family of elderly patients so that they can get the proper care. If it is seen that an elderly patient is enduring neglect, the doctor may breach patient confidentiality.

Q10. Define professionalism. What is the difference between empathy and sympathy? *(TRIU, 2024)*

Ans: Professional is a person who is committed to excellence and who is ethical, responsive and accountable to patients, community and the profession. A professional person practices selflessness, integrity, responsibility, accountability and respect. He respects and maintains professional boundaries between patients, colleagues and society. He has the ability to recognize and manage ethical and professional conflicts. He will abide by prescribed ethical and legal codes of conduct and practice. He demonstrates a commitment to the growth of the medical profession as a whole.

So, professionalism is a set of standards where an individual is expected to adhere to in a workplace in order to appear serious, uniform, or respectful. Professionalism is typically defined as a mix of professional ethics and dress code. Professionalism is a powerful quality and it allows someone to fulfill his role to the best of his ability. It helps him to impress and inspire others. It gives a professional with a deep sense of satisfaction and self-worth.

Professionalism involves consistently achieving high standards, both visibly and invisibly whatever his role or profession.

Characteristics of professionalism

1. **Competence:** As a professional, he gets the job done and done well. Professionalism allows a professional to manage his own and others' expectations, and to ask for support when necessary.
2. **Knowledge:** Professionalism involves developing detailed, up-to-date knowledge, highly specialized. It is important to put his knowledge into action. Being professional he knows not only for self-promotion but also to help himself and others to succeed.
3. **Conscientiousness:** Professionalism involves reliability, setting his own high standards, and showing that he cares about every aspect of his job.
   True professionals plan and prioritize their work to keep it under control.
4. **Integrity:** Integrity keeps professional people true to their word. It also stops them compromising their values, even if that means taking a harder road. Integrity is bound up with being honest—to self, and to the people he meets. His beliefs and behaviors are aligned, and everyone can see that he is genuine.
5. **Respect:** Professionalism means being a role model for politeness and good manner. He truly respects other people by taking their needs into account, and by helping to uphold their rights.
6. **Emotional intelligence:** To be a true professional he needs to stay professional even under pressure.
7. **Appropriateness:** Appropriateness relates to outward appearances, such as dress, personal grooming and body language and his activities.
8. **Confidence:** Confidence is required and well-founded confidence reassures and motivates other people new challenges can be tackled.

Empathy means sharing another person's emotions. Empathy can be defined as a person's ability to recognize and share the emotions of another person. It involves the seeing someone else's situation from his perspective and sharing his emotions his distress. Somebody should put himself into his position. He should imagine self as other (client) in which the client finds himself. Nobody can empathize with an abstract or detached feeling. Empathy is often confused with pity, sympathy, and compassion. Empathy can be felt by client. This helps to understand the issue of concern and accordingly discussion will move so that the client will take his own decision.

Sympathy is a reaction to the plight of others. Sympathy is a feeling of care and concern for someone accompanied by a wish to see him better off or happier. This is feeling for fellow friend or feeling the community. Sympathy implies a greater sense of shared similarities together with a more profound personal engagement. Sympathy works for the friends or clients and expression is shown. Sympathy motivates someone to provide advice, suggestion, and prescription.

Q11. How empathy can be shown to a patient? *(MGUB, 2023; TRIU, 2024)*

Ans: Empathy in healthcare is considered in each and every patient consultation. The matters which are mostly thought may come in the face of consultation. The feelings of patient or patient party should be taken like the feelings accepted by self in the same situation.

- Doctors should be aware of moments that lend the doctors the highest levels of empathy.
- Doctors should listen to carefully for what is not being said.
- Doctors himself should stay present during patient's conversion.
- Doctors have to look for cues that the patient has completed their thought before speaking.
- Doctors should reflect on difficult or emotional conversations.

These issues will make the situation easier to tackle. The patient should be convinced that doctors are thinking for them and it is soothing their pain, providing relief from agony, similar to doctor's distress.

Establishment of an appropriate setting is required to break the bad news to the clients. The patient's perception of the situation must be checked before prompting the news regarding the illness or test results. Determination of the amount of information known is to be assessed by the physician silently and assessment of amount of information is required and desired information is framed. After knowing the medical facts and their implication, the conversation will be initiated.

The patient and/or family's feelings must be empathized with. Open-ended questions will be placed before patient or family member to explore the issue and discussion. Strong feelings in reaction to bad news are normal. Acknowledgement must be shown to what the patient and family are feeling.

Doctors should be well-trained in delivering bad news to patient families. Location, language, body language, and leave, etc., should be considered carefully during delivery of bad news. The family members should be informed in such a way that they will accept the news breaker. As they would be telling the families of the people who died or was diagnosed with a terrible problem, the message or news will be given politely with empathetic attitude.

Q12. How to break a bad news to a patient? *(MGUB, 2023)*

Ans: Breaking bad news to patient's relatives is a common occurrence for medical practitioners. This task requires patience and communication skills. This is approached with empathy for all parties involved. Patient-centered communication techniques and methods are used to deliver bad news.

Breaking bad news is a multifaceted task. Many aspects of the interaction can be predicted. A mental strategy for not only conveying the information, but also receiving it by the family should be planned when a relationship has already been established with the patient. A template or communication protocol should be used while conveying bad news and it will assure quality and empathy into this difficult communication process.

These tips must be considered to keep the conversation as positive and productive as possible:

- Address the information immediately
- Be honest
- Take responsibility
- Allow time for a response
- Focus on the future
- Follow through
- Be respectful
- Be caring

Q13. Discuss SPIKES protocol.

Ans: **SPIKES protocol** is prescribed to interact with the patient or patient's relatives.

The acronym SPIKES stands for **setting up, perception, invitation, knowledge, emotions with empathy and strategy or summary**. Walter Baile and colleagues designed this approach at the University of Texas to help healthcare professionals to accomplish the following while breaking bad news:

An appropriate setting is required to establish. The patient's perception of the situation should be checked to open the news regarding the illness or test results. The amount of information is to be determined. The emotions raised during the interview require to be explored. Empathy must be observed. Support strategy may be established.

A brief of SPIKES protocol:

Setting up: Setting the stage for optimal communication by preparing what to say prior to the conversation is essential to successful communication. Variation in message among members of health team is not expected. A strong, unified, consistent message among all members of the healthcare team is essential.

Perception: The patient's perception of the news to be shared will determine how the news will be conveyed to the patient. This will become more difficult when this is a relatively new patient or one in which the news breaker has not been involved as a member of the care team. The breaking of bad news should not shatter the important coping mechanisms. The patient and family should be in confidence so that they are able to provide informed consent for further testing and treatment.

Invitation: The news breaker should ask for permission to share the current information. The permission to have information shared is granted by the patient or family.

Knowledge: The sharing of bad news must be presented to the patient or party based on the assessed level of patient's understanding, compliance, and wishes for disclosure. The actual sharing of the bad news should be done slowly so that the patient and family understand. Choosing words carefully is particularly important if the news indicates a very poor prognosis.

Empathy: Patients will have a wide range of emotional reactions as their response to the bad news delivered to them. The emotional response may range from silence to dramatic crying and sobbing. Although the entire conversation and time spent interacting with the patient involves empathetic communication, an appropriate and kind response to the emotion demonstrated when the patient hears bad news is critically important.

Strategizing for the future: The patients have to establish a clear plan for the future. At the conclusion of the discussion, both the news breaker and the patient should leave with a clear plan of the steps that need to be taken and the roles each will play in taking those steps.

11a. Give example of a medical error in clinical practice and correct approach to disclose it.

Ans: Example: Consider, it was a busy clinic day and getting worse. Five-year-old Chandramouli was taken by her mother Kalpana to the clinic of Dr Das. The baby had an attack of asthma and was under the care of Dr Das. He examined her and adjusted his prescriptions as per complaints and physical findings. After a while, her mother reminded him that she was due for her booster shot of some vaccine. Dr Das frowned and told her to wait for a few minutes. Dr Das asked the nurse to load the injection in her workstation from his consultation room over the intercom and to keep it for him. He continued to see patients. After few more minutes at the end of consultation of a few patients, the mother knocked her doctor indicating that she was getting late. Listening to mother, Dr Das got up and went to the next room. The nurse was not there but he found a loaded syringe. Then he quickly administered the injection to the child Chandramouli and went back to see the patients.

A few minutes later after vaccination, the nurse called back Dr Das and told him that she has loaded Chandramouli's injections. Listening this, Dr Das dropped everything and went into the injection room. Then he realized that the injection given by him was an antibiotic "gentamicin" and it was made ready or loaded for some other patient Mr Arkaprabha.

Like any other errors, medical errors in clinical care are not so uncommon. The disclosure of medical mistakes is ethically and legally appropriate. This error should be disclosed to the patient party to save doctor patient relationship for mutual trust. In this case, Dr Das should request the mother of Chandramouli to stay for few minutes more in the clinic and he has some important discussion with her for her baby. After seeing the current patient, Dr Das should announce a break.

The correct approach to disclosure of medical errors is appropriately chosen. At this break time, mother of Chandramouli should be offered chair in different room and the nurse will be asked to stay there. Then doctor will see that Chandramouli is not crying, rather she was playing. Dr Das should confess the fact describing his negligence on seriousness of treatment and prevention. As the baby was playing, doctor should assure that nothing adverse will happen soon and later. He was the pray of time pressure. Dr Das should beg full apology for his misdeed. Mother of Chandramouli, Mrs Kalpana, should be released after keeping aside the anxiety, tension from her mind. Other relevant care and services should be given at the same session.

Consequence of failure to disclosure of medical errors including medico-legal, social and loss of trust is conspicuous. Wrong or unnecessary drug to a patient is always related to medico-legal issue. A citizen of society has right to know his treatment on the diagnosed disease, consequence of the management etc. Social backbone will be broken in failure of disclosure of medical error and it is a question of values. Mistrust or loss of trust will become inevitable in failure of disclosure of medical error.

14b. Enumerate consequence of failure to disclosure of medical errors including medicolegal, social and loss of trust.

Ans: Consequence of failure to disclosure of medical errors including medico-legal, social and loss of trust is conspicuous.

- Wrong or unnecessary drug to a patient is always related to medico-legal issue. A citizen of society has right to know his treatment on the diagnosed disease, consequence of the management, etc. This event may reach up to legal battle.
- Social backbone will be broken in failure of disclosure of medical error and it is a question of values. Society trusts their member for their action. Breach of trust will be evident in nondisclosure of medical error.
- Mistrust or loss of trust will become inevitable in failure of disclosure of medical error. Member of the society will not seek any help from a fellow member and man will become sole isolated.

Healthcare providers at all training levels experience feelings of guilt, disappointment, fear and sense of inadequacy of varying degree in case of occurrence of medical error. Impact of medical error on healthcare provider is an important issue deserving keen attention. Junior or senior residents are vulnerable population whose early experience shapes their future behavior in medical services. Residency period in medical services plays a critical role in defining physicians' future practice and responses to medical error. Senior residents and house staff often choose nondisclosure of their mistakes to the attending senior physicians. These trainees who have accepted responsibility for the medical errors and have discussed it with the senior physicians will shape them in patient centric way and will report constructive changes in practice in all medical activities in future.

Q15. How an effective communication can be of help in preventing medication error?

Ans: Medication errors can be taken as a subset of medical error which is defined as failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. These can happen during the ordering, administration, transcribing and dispensing (at a pharmacy) of medications.

Medication error should be minimized and it can be minimized or prevented if appropriate care can be taken in all the steps of patient care. Communication, i.e., effective communication can eliminate the medication error to reach to the completion of planned action or to use the correct plan to achieve an aim in medical condition.

Communication is a fundamental prerequisite of the medical profession and is crucial in ensuring professional success for doctors. The Kalamazoo consensus statement provides a working model of teaching communication skills. Skills, that will be introduced, should include "dealing with emotion".

Ability of communication to patients in a patient, respectful, nonthreatening, nonjudgmental and empathetic way will help reduce the rage or misunderstanding if any.

Administration of informed consent and appropriately addressing of patient queries to a patient undergoing a surgical procedure will reduce haze among patient's relatives.

Seven essential sets of communication are (1) build the doctor—patient relationship; (2) open the discussion; (3) gather information; (4) understand the patient's perspective; (5) share information; (6) reach agreement on problems and plans; and (7) provide closure.

Medication errors can happen during the ordering, administration, transcribing and dispensing (at a pharmacy) of medications. Ordering of medication is done by physician. If physician plays his or her role (efficient communication) for a patient during ordering, errors in ordering can be minimized to the extent up to zero.

The responsible person for administration of medications is nursing personnel. If all the steps of communication are followed during drug administration, medication error can be minimized by nursing personnel or other by chance.

Transcription is done by both the physician and the nurse. Effective communication will minimize the errors done in transcription after huge and proper dialogue by communication.

Dispensing of medication requires good communication between patient or patient's relatives and pharmacists who is dispensing the medicines. Information gathering and sharing will certainly lower the medication error in dispensing of medication. Talking to the patient or patient's relatives and looking the prescription to agree on the final plan will close the session keeping no medication error at dispensing of medications.

Q16. Discuss the four pillars of medical ethics giving examples of each principle. *(WBUHS, 2024; MU, 2023)*

Ans: The principal four pillars of medical ethics are autonomy, beneficence, nonmaleficence and justice. These are the core moral and guiding principles in patient care in any form of doctor-patient interaction.

Autonomy: This is the norm of respecting and supporting individual autonomous decision. Example: A patient agreed to be operated in a surgical condition. On the day of operation he refused the procedure and wanted to leave hospital. If no immediate harm is expected in this patient without operation, then the decision of the patient should be honored. The patient may be released.

Beneficence: This is the norm which prioritizes relieving, lessening or preventing harm; engages in actions that provide benefit to patients; and balances the provision of benefits against the risks and costs of those actions. Example: If a patient attends the clinic with pain abdomen, first and foremost job will be relieving the pain and consideration of other procedure for more benefits balancing the cost and benefit.

Nonmaleficence: This is the norm which avoids actions that can cause harm to patients. Example: If a patient attends the clinic with some sort of problem, he will be given the time tested drug to relieve his problem though claim is there that a new drug has been marketed with better efficacy but side effects are not clear till date.

Justice: This is a norm that supports the fair distribution of benefits, risks, and costs among patients or clients and in society generally. Example: Issue is societal. An epidemic of diarrhea requires treatment. requires minimization of dehydration risk and cost should be lesser so that people and country can afford it.

Q17. Discuss the ethical issues related to informed consent. *(SSUHSA, 2024)*

Ans: Principles of informed consent are decision-making capacity, disclosure, documentation of consent and competency.

Decision-making capacity: This is one of the most important components of informed consent. The components of decision-making capacity are the ability to understand the options, to understand the consequences of choosing each of the options and to evaluate the personal cost and benefit of each of the consequences.

Decision-making capacity simply means that the patient can understand and explain the options, their implications, and give a rational reason.

Disclosure: The doctor or healthcare provider should give (or disclose) to a patient enough information so that the doctor can make an informed decision. The patient may not receive every detail of the test, treatment, or procedure. This information should include the risks and the benefits. Any questions the patients have should be fully explained, in language and terminology that the patient can understand.

Documentation of consent: Verbal consent is required for tests and procedures such as blood tests, X-rays, and splints or casts. For invasive tests or treatments with significant risk, a patient should be given a written consent form preferably in your native local language.

The components should be discussed and included in the written consent form.

- An explanation of the medical condition that warrants the test, procedure, or treatment
- An explanation of benefits of the proposed test, procedure, or treatment
- A description of possible complications or adverse events
- A description of alternative treatments, procedures, or tests, if any, and their relative benefits and risks
- A discussion of the consequences of not accepting the test, procedure, or treatment

The consent form should be signed and dated both by the doctor and by the patient.

Competency: A patient has the ability to make and be held accountable for his decision(s).

Components of a consent form must be present: Disclosure, capacity and voluntariness.

Disclosure supplies information necessary to make an autonomous decision by the patient. It should be ensured that the patient can understand the information provided. A written consent form may be written in lay language in order to assess the situation through the conversation.

Capacity pertains to the ability of the patient to understand the information provided and form a reasonable judgment based on the probable consequences of his decision.

Voluntariness refers to the patient's right to exercise his decision without being subjected to external pressure such as coercion, manipulation, or undue influence.

Q17b. Write in short about principles and components of "informed consent" in patient care. *(TRIU, 2023)*

Ans: Ethics is standing on four pillars which can be taken as components of medical ethics. They are autonomy, beneficence, nonmaleficence and justice. Informed consent is the process in which a healthcare provider informs a patient about the risks, benefits, and alternatives of a given procedure or treatment where the patient will be competent to make a decision about whether to undergo the procedure or intervention or to take treatment.

Autonomy is the most fundamental principle which provides respect to the person. By the empowerment of this principle, the patient or participant in research can take decision voluntarily whether the patient will receive treatment or not or whether the selected person will be participant or not. The patient or participant cannot be pressurized to give consent for any form of procedure or intervention or treatment. In this way patient or participant is protected by the principle of autonomy. The voluntary consent means that the person involved should have legal capacity to give consent without the application of any element of force, fraud, deceit, duress, overreaching.

Beneficence is another concept in research ethics where researcher describes the usefulness and benefits of the research participants. The researcher expresses the beauty of the research study to the selected persons how the research participants will be benefitted. From the consciousness the research participants will take decision for their benefit or benefit of the society in the projected study. So this second ethical issue is also related to informed consent.

Nonmalificence is really an obligation of a physician or a researcher not to harm the patient or research participant. The physician or the researcher cannot kill, cannot cause pain or suffering Nonmaleficence, cannot incapacitate, cannot cause offense, and cannot deprive others by their treatment or research. Researcher will elaborately express that no harm will be seen by this study or a particular effect may be seen

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in human beings. This clarity will be evident before research participant. So, after knowing the merits and demerits of the study, informed consent is given by the research participants and thus ethics are related with informed consent.

Justice is one of the principles of medical ethics. No caste, creed, religion, economy of the people will separate them to get similar advice, medical therapy and protective remedies. Justice will be given to all participants in any kind of problems. So, justice is also considered in giving informed consent.

In conclusion, informed consent is an ethical and legal requirement for any research involving human participants. The concept of informed consent has become a fundamental principle in clinical research. Informed consent is essential for ethical medical research. Informed consent as a critical safeguard of the principles of autonomy or respect for persons, of beneficence (benefits), of nonmaleficence (harm) and of justice. It is important to note that the principle of informed consent is continuously evolving with new laws and regulations and this basic principle has been unaltered since inception regarding protection of human subjects in research to ensure the autonomy and other principles.

Q18. What is harm in medical practice? Discuss types of harms in medical ethics citing various examples for each.

Ans: There is no uniform definition of **medical harm**. World Health Organization (WHO) has defined medical harm as "**an injury related to medical management, in contrast to complications of disease**". A critically important area of excess spending and patient suffering is connected to care that is not only unnecessary, but harmful to patients.

Institute for healthcare improvement has defined harm as the "**unintended physical injury resulting from or contributed to by medical care (including the absence of indicated medical treatment), that requires additional monitoring, treatment or hospitalization, or that results in death.**"

Types of harms:

Medical errors: Medical error is a type of medical harm. An error can be defined as the "failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim." Incomplete planned operation may be the example of medical error.

Healthcare-acquired infections: Healthcare-acquired infections (HAIs) are infections that are not associated with the reason for which a person came to the hospital or sought healthcare.
HAIs are typically distinguished from medical errors. This could be due to the fact that information about infections is tracked using different mechanisms and strategies.

Serious reportable events: Serious reportable events (SREs) are mostly preventable clinical events that cause serious patient harm. Examples include surgery on the wrong body part or an object left inside a patient after surgery.

Medication errors: Medication errors can be treated as a subset of medical error. These can happen during the ordering, administration, transcribing and dispensing (at a pharmacy) of medications.

Hospital-acquired conditions and healthcare-acquired conditions: Hospital-acquired conditions (HACs) are used by public and private payers in hospital reimbursement. These are conditions which may occur in the hospital, may cause injury to patients. These could reasonably be prevented through the application of evidence-based guidelines.

Q19. Define patient autonomy. Compare between autonomy and paternalism. Describe briefly the responsibilities of patients and doctors in shared decision making. *(TRIU, 2023)*

Ans: Patient autonomy can be defined as the right of patients to make decisions about their medical care without the influence of their healthcare providers to take the decision. Patient autonomy allows healthcare providers to educate the patient on certain relevant issue but does not allow the healthcare providers to make the decision for the patient.

Paternalism is the interference of an individual with another person against one's will and is defended or motivated by a claim that the person will be protected from harm. The issue of paternalism may come with respect to restrictions by the law such as withholding of relevant information concerning a patient's condition by physicians.

Paternalism is an action that limits a person's or group's liberty or autonomy and is intended to promote their own benefit. Paternalism can also imply that the behavior is against or regardless of the will of a person. This behavior expresses an attitude of superiority over other person such as doctor over a patient.

Patient autonomy and paternalism are diagonally opposite in direction. From the patient's view and ideal human condition, patient autonomy should not be governed by paternalism of doctor.

Shared decision-making affords patients and their families the autonomy to make difficult decisions a bit easier decision after receiving comprehensive information about medical facts and treatment options from the treating physicians. Here patients' values are essentially respected. The various facts involved in the problem management should be explained by physicians first. In a complicated situation, patients and family members are asked to contribute in decision for doing any support by the physician. After these issues, it is important to elicit patients' preferences and goals. Once the treatment options and outcomes are identified and all are explained in both ways then an actual decision will be established. This activity is complex and requires a commitment of time. This may be enhanced through employment of a multidisciplinary team approach.

In contrast to SDM, the traditional care system placed physicians in a position of authority with patients playing a passive role in care. This disregards the patient autonomy. Physicians instructs the patients to follow his instructions and patients rarely took part in the treatment decision.

So Shared Decision-Making in medicine (SDM) is a process in which both the patient and physician contribute to the medical decision-making process and agree on treatment decisions or treatment options. Healthcare providers should explain treatments and alternatives to patients and help them choose the treatment option that best aligns with their preferences as well as their unique cultural and personal beliefs.

Q20. Raghu, a 45-year-old male, came to the physician with pain in abdomen. After listening to the patient, the doctor advises battery of tests and scans and asked him to return with the reports. The doctor thinks that he has done the right thing as now he can quickly move to the next patient. In this way he was able to give services to many patients in a short span of time. Comment on the ethical aspects and also highlight which ethical principle (if any) is/are being compromised here in this case scenario.

Ans: Bioethics is an important issue for the benefit of patients. During caregiving time, the ethical issues like autonomy, beneficence, nonmaleficence and justice should never be forgotten. The doctor may lose the patient in future, may be accused for negligence and the society may miss the client with loss of his productivity.

In this case, patient attended to the physician with history of pain abdomen which should be relieved or lessened with the confidence of the patient. The physician listened to the problems and prescribed battery of tests, scan, etc. to review the patient. Basic issue like clinical examination based on the history was not done. This irresponsible behavior will discourage the patient to re-attend to the clinic. Confidence of the patient was not gained by the physician.

The norm of respecting and supporting individual autonomous decision is the moral principle which is known as **autonomy**. Whether the client is accepting the advice, this has not been ascertained at all. The autocratic decision given by the physician will not be accepted by the patient in most of the time in such cases. Autonomy principle has been broken in this situation.

Beneficence is the norm which prioritizes relieving, lessening or preventing harm; engages in actions that provide benefit to patients; and balances the provision of benefits against the risks and costs of those actions. In the case scenario, the physician did nothing to relieve or lessen or prevent the pain abdomen. Battery of tests and scan may not be relevant or helpful for the treatment of the case but these were prescribed. Other

more sensitive and specific issue is consideration of cost to manage the case. The patient may be unable to afford the cost do these investigations. Violation of the principle of beneficence was done here.

Nonmaleficence is another principle which avoids actions that can cause harm to patients. Apparently physician did not cause harm but delay in real treatment may cause harm, e.g., appendicitis to appendicular lump with complications, even death. Indirectly this principle also has been broken by the physician.

Last principle is **justice** to the client and this is a norm that supports the fair distribution of benefits, risks, and costs among patients or clients and in society generally. The patient will bear the costs for treatment. This rampant adoption of various tests before clinical management compels to bear individual or social costs and adoption of high-end investigation may not be the appropriate technology for the members of the society. Equity is core of justice for the society. Physician's behavior is not following the norms of principal bioethics.

So almost all moral principles were broken here. Dealing patients are noble, moral and humane issue. No physician should do this what was done by this physician.

Q21. You are the on-call doctor. A 15-year-old girl was taken in your clinic at 11 PM. She was conscious and said that she fell down in stairs. She is now bleeding profusely and requires an urgent blood transfusion. As the patient was being taken into the theatre, her mother arrived and demanded that doctor should not go ahead with the blood transfusion. How would you respond to this situation?

Ans: Certain steps should be followed to tackle this situation of denial of a treatment. Autonomy of the patient's relative must be respected but not at the cost of one's life.

As the patient party (relatives/caretaker) has introduced her as the mother of the child, she is natural and legal guardian of the 15-year-old girl child. She will be accepted and greeted by the doctors and will be asked to share her total views on the issue. Time also should be kept in mind that treatment is essential within a short period of time.

Doctors should introduce their status to build the doctor—patient relationship and they will open the discussion on the present issue. Information will be gathered to understand the patient's perspective on the issue of concern. The principal issue was that mother demanded that doctor should not go ahead with the blood transfusion. So, it is easily concluded that mother may have some misconception or wrong perception or partial information on blood transfusion.

Mother may think that blood transfusion may cause diseases in her child. This should not be done as it is others tissue fluid which is culturally forbidden in their society. This may be due to some unexplored issue. To explore the cause of denial of blood transfusion probing may be required and accordingly correct and appropriate information should be shared. Blood is the only solution of that situation and blood cannot be procured from any chemist shop as is not possible till date to develop blood artificially in the factory. It is expected that all these discussions will melt her agitation on blood transfusion. Information shared by polite and helping leader doctors often relieves the agony of care providers of the patients. Discussion will focus on blood transfusion may cause some diseases but before transfusion, blood is tested for those diseases and her baby requires blood transfusion only to save her from the impending death. Balance between all these issues will be done by mother and come to the agreement with the doctors view.

In this way, mother and healthcare providers may reach agreement on problems and will help plan the treatment required. Denial issue will be resolved thus and discussion will be closed to rush for the treatment of the child.

Q22. How to handle a patient ethically who is upset with treatment received from another physician?

Ans: An appropriate counseling is required to relieve the pain gained from another physician. Cognitive behavior therapy may be helpful if at all it is required. The steps which are essential to handle the issue of upset with the treatment received from another physician.

a. Active listening
b. Probing

c. Facts discovered in the light of ethics
d. Counseling, coaching and advice in relation to the roles of a physician

The patient should be asked to elaborate the matter of upset. He may describe the matter of treatment received from other physician. It is possible to assess in which principle(s) of autonomy, beneficence, nonmaleficence and justice has been severely affected and correction or counseling is required.

In case of autonomy, it may be found that respect and support of the individual autonomous decision has not been taken care of. In this case, the patient will be given space to decide on his status and decision on treatment given by treating physician. Thus, his pain can be addressed in appropriate way.

In case of beneficence, it may be found that prioritization in relieving, lessening or preventing harm has not been given; actions has not been provided in the benefit to patient; and balance has not been considered in the provision of benefits against the risks and costs of the given actions. After probing, facts will be discovered and accordingly actions will be taken to minimize the upset caused by other physician.

In case of nonmaleficence, actions taken by other physician have not been avoided to cause harm to patient. So, what harm has been caused will be elicited by history and probing. According measures for reduction of upset can be taken here in new setup.

In case of justice, it may be found that the fair consideration of benefits, risks, and costs for the patient was not done. So, he left the physician and came to this setup. Risk-benefit and cost-benefit analysis may be ventilated to the patient and then patient will take decision on his own benefit for his treatment. Thus, he may be benefited to reduce the upset by his own.

So, in the light of bioethics, patient may be coached and counseled and accordingly advice given by physician will help the client patient to come out from the previous upset.

Q23. How will you tackle noncompliance of patient to your prescription?

Ans: Noncompliance to a prescription of a physician is off and on observed by patients. The root cause of noncompliance can be related to attitude of both the patient and the physician, ethical issues and above all communication.

The patient considers the cost (affordability) of the drugs, relief from the symptoms, cure of the disease and lastly the future occurrence of the similar disease (prevention). The doctor also thinks in the same line but communication may not be evident enough to the patient or care taker due to shortage of time, ill attitude etc.

So, all these above mentioned issues should be seriously considered, applied in the practice field to eliminate noncompliance.

The socio-economic status of the patient's family may guide a doctor to write a suitable alternative drug so that patient can afford the cost of the drugs, can purchase the drugs and consume it as per advice of the doctor. Appropriate consumption of the drugs will relieve the symptoms present in the patient and in most of the cases cure him. Preventive measures must be discussed with the patient.

Benefit of treatment and worst outcome without treatment should be communicated to the patient and thus decision taken by patient may be changed in favor of compliance. Patient's decision is absolute to get relief from the pain of medical problem and this can be done with proper counseling for treatment.

Appropriate active listening by physician and accordingly advice will help the patient comply the prescription of physician. Understanding of the patient on the whole advice must be checked by physician at the end of clinical session. Without this last factual event, everything may fail in favor of noncompliance.

All the issues related to attitude of both the patient and the physician, ethical issues and communication should be observed principally by the physician to overcome the noncompliance of the prescription, rather to comply advice given by physician.

Q24. How will you tackle a situation where patient is angry due to the long time spent in the waiting room?

Ans: We can support someone who is experiencing anger. Some steps should be properly followed and two or more steps can be applied together. Here in this case, a patient became angry due to long time spent in the waiting room.

One thing can be kept in mind that many patients in the same situation was calm and cool and they consulted their doctors without showing any anger. So, the patient who became angry requires appropriate care to come out of the anger.

The patient should be asked in the chamber to sit down before the physician. The doctor/physician should stay calm and cool giving full attention to hear him.

The patient will be asked to describe his concern and the physician will try to listen to what he says in his concern. Active listening is required to encourage the patient to say blocklessly.

Space must be given to recall all his issue. He became angry and expressed it in a time where some triggering event occurred.

Doctors should set boundaries which will create a clear guideline or rule how a doctor would like to be treated. Empathetic thought will help understand the patient. They let doctor know what is and what is not acceptable or okay.

Doctor should help the patient identify his trigger(s) for anger in this clinic. That trigger issue must be clarified by doctors. All relevant issues in this triggering point should be vividly discussed to eliminate the starting point of anger and thus it may be helpful to prevent grievances in future.

Now the doctor may ask the patient to seek professional help which may be supported by doctor. This step may calm and cool the patient and this satisfaction will block future rage.

All these actions will not be done in leu of peace of the self. The doctor should also look after his own wellbeing.

Thus, interchange of ideas and views of the system will clarify the ambiguous issue of both the participants and it will make a trail of peace without anger.

CHAPTER

22

Family Adoption Program

Q1. What is the rationale of Family Adoption Program (FAP), objectives and activities of FAP?

Ans: The Alma-Ata Declaration on 12th September, 1978 in the international conference on primary health care was a major breakthrough achieved by World Health Organization (WHO). 'Health for all', across all geographical boundaries of the globe was a milestone to be met with by all developing and developed countries of the world by year 2000. The Government of India (GOI) had already launched a national Community Health Worker (CHW) scheme and Village Health Guide (VHG) programs in 1977. However, this program failed to achieve the expected impact. State governments extended their support in this project through different schemes. One of the most successful products is the availability of about 1 million Accredited Social Health Activists (ASHA) across the country, especially in this challenging pandemic. The erstwhile Medical Council of India (MCI) was making continuous modifications in setting up and maintaining high standards of medical education in India so that equitable health distribution through well-trained allopathic doctors could be provided to the citizens of India. However, the rural population remained deprived of general medical treatment.

The governments and erstwhile MCI tried to increase the number of seats/medical colleges in the country to meet with the demands of population. One of the major lacunae of the current Indian medical education seems to be 'production of doctors with poor practical knowledge'. The deficiency is in terms of training in identifying disease, differentiating a serious condition requiring emergency treatment from a milder or chronic ailment, and practical training of administering intravenous fluids, drawing blood, wound dressings and such other rudimentary skills, so that doctors can cater to the rural health care needs efficiently. One of the reasons could be that clinical training is given invariably in a tertiary care, if not secondary care setting within medical colleges.

Aim: Family adoption program aims to provide an experiential learning opportunity to Indian Medical Graduates for community-based health care and thereby enhance equity in health.

Objectives:

During the Medical UG training program, the learner should be able to:

- Orient the learner towards primary health care
- Create health-related awareness within the community
- Function as a first point of contact for any health issues within the community
- Act as a conduit between the population and relevant health care facility
- Generate and analyze related data for improving health outcomes and evidence-based clinical practices.

Specific issues:

Family adoption program is recommended as a part of curriculum of Community Medicine and should begin from 1st professional year with competencies being spread in ascending manner for entire MBBS training program. The orientation towards the same may be a part of foundation course under the theme of 'field visit to community health center' (8 hours) which is already allocated to foundation course as per GMER, 2019.

The family adoption shall preferably include villages not covered under PHCs adopted by medical college. If transit time from college to site is more than 2 hours, then *bastis/jhuggis*/towns on outskirts of cities may be considered for family adoption.

Medical students may be divided into teams and each team may be allocated visits. Family adoption program through village outreach where-in each student shall adopt **minimum of three (03) families and preferably five (05) families**. These families may be introduced during their first visit; however, the model may be flexible depending upon the number of students and available families for adoption. The entire team should work under a **mentor teacher** for entire part of the training program.

Activities during FAP:

- Every college may arrange one diagnostic medical camp in the village wherein identification of—anemia, malnutrition in children, hypertension, diabetes mellitus, ischemic heart diseases, kidney diseases will be done, and any other local problems may be addressed.
- If required, patients shall be admitted in the hospital for acute illness under care of student, charges may be waived off or provide concession or government schemes.
- For chronic illness, students shall be involved.
- Subsidized treatment charges may be provided under government schemes or welfare schemes.
- Camps may be arranged by Dean and Community Medicine (PSM) department with active involvement of Associate/Assistant Professors, social worker and supporting staff. Local population may be involved with village leaders.

Q1a. Describe the role of MBBS student in Family Adoption Program (FAP) from the 1st professional period to final professional period. *(TRIU, 2023; DBRAUA, 2024)*

Ans: At the end of the program, students may be envisioned to become leaders for the community.

Targets to be achieved by students:

1st Professional Year:

- Learning communication skills and inspire confidence amongst families
- Understand the dynamics of rural set-up of that region
- Screening programs and education about ongoing government sponsored health related programs
- Learn to analyse the data collected from their families
- Identify diseases/ill-health/malnutrition of allotted families and try to improve the standards

2nd Professional Year:

- Inspire active participation of community through families allotted
- Continue active involvement to become the first doctor/reference point of the family by continued active interaction
- Start compiling the outcome targets achieved

3rd Professional Year:

- Analysis of their involvement and impact on existing socio-politico-economic dynamics in addition to improvement in health conditions

Final visit is done in the initial months (May/June) to have last round of active interaction with families.

Prepare a report to be submitted to department addressing:

- Improvement in general health
- Immunization
- Sanitation
- De-addiction
- Improvement in anemia, tuberculosis control
- Sanitation awareness
- Any other issues
- Role of the student in supporting family during illness/medical emergency
- Social responsibility in the form of environment protection program in form of plantation drive (medicinal plants/trees), cleanliness and sanitation drive with the initiative of the medical student.

Table 1: Competency wise distribution of FAP in professional years.

Professional year	*Competency: The student should be able to*	*Objectives*	*Suggested teaching learning methods*	*Suggested assessment methods*	*Teaching hours*
1st professional	Collect demographic profile of allotted families, take history and conduct clinical examination of all family members	By the end of this visit, students should be able to compile the basic demographic profile of allocated family members	Family survey, Community clinics, Multispecialty camps	Community case presentation, OSPE, logbook, journal of visit	6 hours
	Organize health check-up and coordinate treatment of adopted family under overall guidance of mentor	By the end of this visit, students should be able to report the basic health profile and treatment history of allocated family members	Reporting of follow up visits, PRA techniques (transect walk, group discussion), Community clinics	Community case presentation, OSPE, logbook, journal of visit	9 hours
	Maintain communication and follow up of remedial measures	By the end of this visit, students should be able to provide details of communication maintained with family members for follow-up of treatment and suggested remedial measures	Participation in and process documentation of activities (NSS activities) along with reporting of photographic evidence	Community case presentation, OSPE, logbook based certification of competency, journal of visit	6 hours
	Take part in environment protection and sustenance activities	By the end of this visit, students should be able to report the activities undertaken for environment protection and sustenance like study of environment of families, tree plantation/herbal plantation activities conducted in the village		Logbook based certification of competency, journal of visit	6 hours Total time in 1st Professional MBBS: **27 hours (9 visits)**
2nd professional	Take history and conduct clinical examination of all family members	By the end of this visit, students should be able to compile the updated medical history of family members and report their vitals and anthropometry	Family survey, community clinics	Community case presentation, OSPE, logbook, journal of visit	6 hours
	Organize health check-up and coordinate treatment of adopted family under overall guidance of mentor	By the end of this visit, students should be able to report the details of clinical examination like Hb%, blood group, urine routine and blood sugar along with treatment, history of allocated family members	Community clinics, multispecialty camps	Community case presentation, OSPE, logbook, journal of visit	9 hours

Contd

Contd...

Professional year	Competency: The student should be able to	Objectives	Suggested teaching learning methods	Suggested assessment methods	Teaching hours
	Maintain communication and follow up of remedial measures	By the end of this visit, students should be able to provide details of communication maintained with family members for follow-up of treatment, and suggested remedial measures along with details of vaccination drive	Reporting of follow up visits, PRA techniques (transect walk, group discussion) Community clinics,	Community case presentation, OSPE, logbook based certification of competency, journal of visit	9 hours
	Take part in environment protection and sustenance activities	By the end of this visit, students should be able to report the activities undertaken for environment protection and sustenance like study of environment of families, tree plantation/herbal plantation activities conducted in the village	Participation in and Process documentation of activities (NSS activities) along with reporting of photographic evidences	Logbook based certification of competency, journal of visit	6 hours Total time in 2nd Professional MBBS: **30 hours (6 visits)**
3rd professional	Take history and conduct clinical examination of all family members	By the end of this visit, students should be able to update the medical history of family members and their vitals and anthropometry	Family survey, community clinics	Community case presentation, OSPE, logbook, journal of visit	3 hours
	Organize health check-up and coordinate treatment of adopted family under overall guidance of mentor	By the end of this visit, students should be able to report the details of clinical examination like Hb%, blood group, routine urine and blood sugar along with treatment history of allocated family members	Community clinics, multispecialty camps	Community case presentation, OSPE, logbook, journal of visit	3 hours
	Maintain communication and follow up of remedial measures	By the end of this visit, students should be able to provide details of communication maintained with family members for follow-up of treatment, and suggested remedial measures along with details of vaccination drive	Reporting of follow up visits, PRA techniques (transect walk, group discussion), community clinics	Community case presentation, OSPE, logbook based certification of competency, journal of visit	3 hours

Contd...

Contd...

Professional year	*Competency: The student should be able to*	*Objectives*	*Suggested teaching learning methods*	*Suggested assessment methods*	*Teaching hours*
	Take part in environment protection and sustenance activities	By the end of this visit, students should be able to analyze and report the health trajectory of adopted family along with remedial measures adopted at individual, family and community level	Participation in and process documentation of activities (NSS activities) along with reporting of photographic evidences	Logbook based certification of competency, journal of visit	3 hours 3 hours (Total time in 3rd Professional MBBS: **15 hours (5 visits)**
Final professional	Final counseling of the family members of allotted families and analyze the health trajectory of adopted family under overall guidance of mentor	By the end of this visit, students should be able to analyze and report the health trajectory of adopted family along with remedial measures adopted at individual, family and community level	Small group discussion (report of the health trajectory of adopted family)	Logbook based certification of competency, journal of visit	6 hours (1 visit) Total time in final Professional MBBS: **6 hours (1 visit)**
Total	1st Prof	9 visits	27 hours		
	2nd Prof	6 visits	30 hours		
	3rd Prof	5 visits	15 hours		
	Final Prof	1 visit	6 hours		
		21 visits	**78 hours**		

Specimen of Logbook for Family Adoption Program (FAP).

Table 2: Details of the adopted Family.

Sl. no.	*Name of the head of family*	*No. of family members*				*family type (N/J)*	*Address*	*Religion*	*Caste*
		M	*F*	*C*	*Total*				
1.									
2.									
3.									
4.									
5.									

Medical camp and its operational guidelines:

- Medical camp has been made mandatory from the academic year 2023-2024.
- One medical camp in every *village/clusters/slums/seva bastis* adopted under Family Adoption Program should be organized wherein parameters like demographics, vitals, blood pressure, hemoglobin, blood Sugar and Urine routine (by Uristix), etc., will be recorded. A Google form for the submitting same will be generated and shared to all the colleges by NMC.
- Head of the Community Medicine Department will take the responsibility to monitor these activities and submit the report to Under-Graduate Medical Education Board through the Head of the institute.
- Community Medicine Department is encouraged to publish at least one research article on their experiences about the FAP in any indexed journal in the current year. Any other department/faculty involved in these activities are also encouraged to publish this article.

Camp Guidelines:

- Conduction of at least one health camp under family adoption program (FAP) survey (for MBBS batch admission year 2022-23)
- A committee under the chairmanship of head of the institute/college is to be formed for conducting the health camps under FAP survey.
- The department of community medicine will be the nodal department for the above activity.
- Resources required for the camp (s) should be mobilized at the level of college/institute in coordination with Community Medicine department.
- Faculty members and Resident Doctors from other departments can be involved in the conduction of the health camp(s).
- Data of the health camp (s) should be maintained by the department of Community Medicine.
- Institutes/Colleges will share the de-identified data of all the families adopted during
- FAP (admission year 2022) with UGMEB of NMC in the prescribed formats as per specified time.
- Health awareness via health talks, role-plays, rallies, etc., on relevant health topics as identified by the Community Medicine department may be done.
- Cleanliness, sanitation and/or plantation drives can be planned during the health camps with involvement of local community volunteers.
- Lastly, queries may be raised to the e-mail ID: fap.ugmeb@nmc.org.in

College/Institute level reporting format of the adopted families/households under FAP is available.

FORM 1

Form 1 contains various issues of families of the program area.

Table 3: Details of FAP survey required to be submitted by the institute/college.

Sl. No.	Details required	Details
1.	Total number of sanctioned MBBS seats for batch 2022	
2.	Total number of students (from batch 2022) participating in the health camps	
3.	Total number of faculty members involved from the Community Medicine Department	
4.	Total number of faculty members involved from the other departments	
5.	Total number of residents (SR and JR) involved from the Community Medicine Department	
6.	Total number of residents (SR and JR) involved from the other departments	
7.	Total number of health camps organized (during FAP survey)	
8.	Total number of households adopted	
9.	Total population adopted	
10.	Total number of beneficiaries during the camps	
11.	Total number of beneficiaries from the adopted households during the camps	

Table 4: Distribution of adopted families under FAP as per types of family.

Types of family	*Number*	*Percent*
Nuclear		
Joint		
Total		

Table 5: Age and gender-wise distribution of population adopted under FAP.

Age group	*Males*	*Females*	*Total*
<1 year			
1–5 years			
6–14 years			
15–45 years			
46–60 years			
>60 years			
Total			

Table 6: Distribution of families adopted under FAP according to socio-economic status.

Socio-economic status as per modified BG Prasad Scale October 2023	*Per capita monthly income limits (₹/month)*	*Number*	*Percent*
Upper (I)	9098 and above		
Upper Middle (II)	4549–9097		
Middle (III)	2729–4548		
Lower Middle (IV)	1365–2728		
Lower (V)	Below 1365		

Source: Mahantshetti S, Singh J, Dhandapani S. Updated Modified BG Prasad Classification for October 2023. Natl J Community Med. 2024;15(1):89-90.

Other tabular presentations on distribution of families/households adopted under FAP are:

- NCD screening includes, blood pressure, random blood sugar.
- Distribution of participants according to their biological variables like stunting, wasting, BMI, anaemia, blood sugar, hypertension etc) should be recorded appropriately to assess the status of the population of the adopted area.

FORM 2

Declaration of Data Authentication

We, the undersigned, hereby declare that the data collected during the health camps held under the Family Adoption Program Survey, conducted by [Name of the Institute/College] are authentic and accurately represent the findings of the survey. This declaration serves to confirm that the following conditions have been met to ensure the integrity and reliability of the data.

1. **Originality:**
   - The data collected are original and were gathered through scientifically sound and ethically approved methods.
   - Any secondary data utilized from other sources have been properly cited and referenced.
2. **Accuracy:**
   - The data presented have been accurately recorded, processed, and analyzed.
   - No data have been manipulated, altered, or fabricated to misrepresent the findings of the survey.

3. **Ethical compliance:**
   - The collection, handling, and presentation of data adhere to the ethical guidelines and standards set forth by [relevant ethical committee or institution].
   - Informed consent was obtained from all participants, and their privacy and confidentiality have been safeguarded.
4. **Data management:**
   - The raw data and related documentation are securely stored and are available for review upon request by the relevant authorities or for the purpose of peer review.
   - Proper data management practices have been followed to ensure the long-term preservation and accessibility of the data.
5. **Conflict of interest:** Any potential conflicts of interest that may have influenced the data collection or analysis have been disclosed.

By signing this declaration, we affirm the authenticity and integrity of the data collected during the health camps and acknowledge our responsibility in maintaining the highest standards of ethics and scientific rigor.

Signature with date and designations:

- Faculty In-charge (health camps under FAP survey)
- Head of the Department of Community Medicine
- Head of the Institute/College with Seal and Stamp

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